ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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The Acme Automatic Safety Engine.

It is an idea very generally held that economy in electric lighting can only be attained in the operation of large plants, the cost for attendance being nearly as much for a small as for a plant of considerable size. With this engine, which is automatic in not only governing the speed, but in feeding the fuel and water used, the expense depends only on the amount of work done. For a run of ten hours, less than five gallons of oil are required to develop one horse-power. This costs less than seven cents per gallon by the barrel at most points in the country. The cost for a ten hours' run is less than 35 cents. With the excellent little dynamos built by the Household Electric Light Company, eight 16 candle-power lights or sixteen 8 candle-power can be run, or any combination of the larger and smaller lights.

Sixteen candle-power gas burners are rated at 5 cubic feet per hour; in most cases they consume 7 or 8 cubic feet, and the cost is not less than 1 cent per hour per light.

The eight incandescent lamps cost 35 cents for ten hours, or less than one-half cent per hour, while gas costs more than double the amount.

The lights can be turned off, one at a time, without affecting the remaining.

There is no flicker, the automatic governor being extremely sensitive to all changes of load. If less than the full number of lamps is run, less steam is used by the engine, and the supply of oil fed to the boiler is reduced. Dwellings of ordinary size can be lighted systematically at a less expense than gas. The only care required is a few moments when starting the engine. Skilled labor is not required; in fact, it requires no more brains on the part of the servant to operate this system than to work a pump or oil a grindstone.

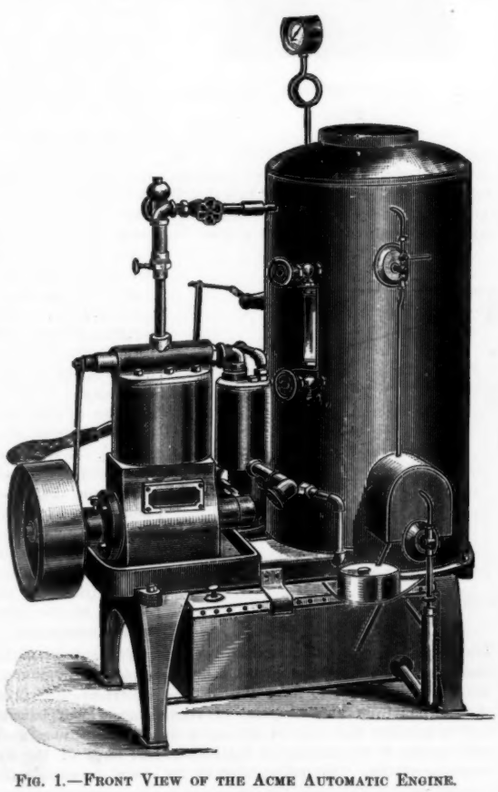


FIG. 1.—FRONT VIEW OF THE ACME AUTOMATIC ENGINE.

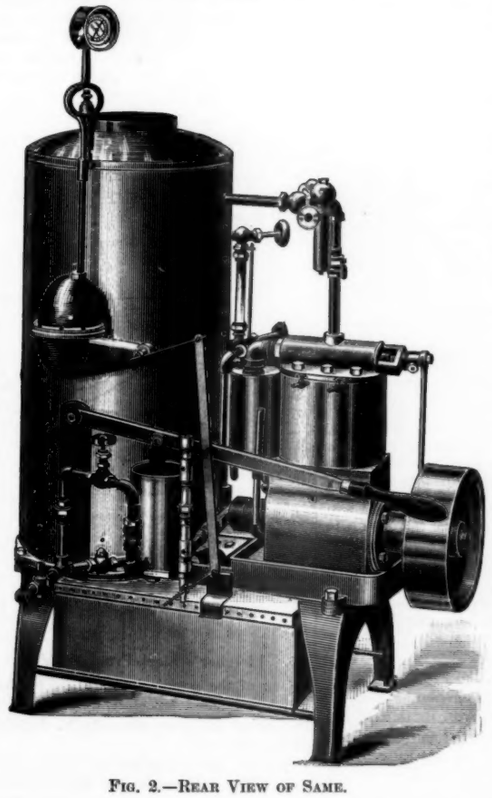


FIG. 2.—REAR VIEW OF SAME.

The Government Telephone Suit.

The attorneys in the telephone case were in the United States District Court, at Columbus, June 9th, the following eminent counsel being present: Allan G. Thurman, Jeff Chandler, Jos. E. McDonald, Aaron F. Perry, J. J. Storrow, and R. A. Harrison.

A. F. Perry, counsel for the Ohio telephone companies, who are made party defendants in the case, asked leave to file pleas on behalf of his clients. These pleas were; First, that in the absence of the defendant, the Bell Telephone Company, the case cannot proceed; second, that the validity of the patent has already been tested by the United States Courts, and, third, the question of jurisdiction is raised.

Judge Thurman spoke briefly in opposition to the admission of these pleas. He argued that the only thing the court could do was to admit the filing of a demurrer, which could be done without leave, and with a motion for leave, to file pleas.

Mr. Storrow, for the defense, said that the filing of these pleas would raise the whole question at once and determine whether the Bell Telephone Company should be brought into the case.

Judge Thurman was about to resume, when Judge Jackson interrupted him by saying that the court would decide that the demurrer should be filed, and also a motion for leave to file pleas, so that this motion could be heard on Sept. 20, in Cincinnati.

* * The Electric Service Company are equipping the new building of Massachusetts Hospital Life Insurance Company, on State street, Boston, with their electric heat regulating apparatus. This company have during the past year equipped many large public buildings and private residences with apparatus, and the same has given uniform satisfaction.

Ozone.

HISTORY OF ITS DISCOVERY—THEORIES OF ITS NATURE AND VARIOUS METHODS OF PRODUCTION AND USES.

Editors Electrical Review:

I am trying to produce "ozone" in quantity and on a commercial working scale and at a price sufficiently low to enable it to be used in various industries, but in my case more particularly applied to the rapid oxidation of base metal ores, sulphurets, etc., to enable them to be cheaply and profitably worked.

That it has been produced in the laboratory and for medical use with small static electrical machines I know, but I must have it in quantity and produced from electricity generated by power and with some machine more tangible and stronger than glass plate or disks.

In order to get posted as to what has already been done in the way of producing "ozone," and as to its effects in various ways, as already known, and as to the various machines already made and tried, I desire such information as I can procure from persons or books on the subject, and to this end I take the liberty of addressing you to get the names of any parties to whom I might apply for information, or the names of any works that will, or may, assist my practical investigations here, which, as you may suppose, in this out-of-the-way place are quite expensive as regards the machines.

Any information you may give me, or assistance in my researches, will very much oblige me, and thanking you in advance for trouble given, I am, yours very truly,

WM. P. DEWEY.

San Francisco, Cal., 310 Pine street,
March 1, 1886.

OZONE — PREPARED EXPRESSLY FOR THE "ELECTRICAL REVIEW" BY PROF. P. H. VAN DER WEYDE.

For the full understanding of a philosophical subject it is often advisable to review the history of its discovery, especially when it is comparatively new, as is the case with ozone, of which the most available methods of production have not yet been discovered, while its beneficial functions in the economy of nature have only quite recently commenced to be appreciated, and its useful practical applications are in their infancy. My attention was first called to this substance by Shoenbein's labor, of which I read an account in 1840, and, after making some experiments, which convinced me of the reality of the new discovery, I published in the Netherlands, in the year 1841, the following account of Shoenbein's discovery:

"ON OZONE—A New Element Obtained by means of Electricity." Translated from *The Letterbode*, published in Haarlem, Netherlands, June 1, 1841.

Anyone who has ever occupied himself with galvanic experiments must surely have noticed that during certain electro-chemical operations a peculiar odor is evolved, which resembles that of the sparks and luminous flashes seen in friction electricity. Schoenbein has undertaken a series of experiments intended to reveal the circumstances under which this electro-chemical flavor is evolved, the causes which promote it, and, if possible, the principle from which it depends. This peculiar odor may be observed at the positive electrode, where certain aqueous solutions are decomposed by the voltaic current. The oxygen which is evolved there, possesses a very strong and peculiar flavor, which is identical with that observed when a common frictional electric machine is operated. Schoenbein has found that this odor is produced by the decomposition of water, diluted sulphuric acid, solution of phosphoric acid, nitric acid, and many neutral salts. The strongest odor is obtained by the decomposition of sulphuric acid, while the solution of hydrochloric, bromic and iodic acids do not only fail to show it, but by their presence prevent that the odor will appear

in the merest trace, and this in solutions which otherwise would produce an abundance of the same. He has further observed that the oxygen evolved from a solution which possesses the property to produce this odor can be preserved in well-closed bottles. According to the properties possessed by this oxygen, Shoenbein was compelled to the conclusion that the odor is due to the presence of a small quantity of a new, and thus far unknown, element, which appears to play an important role in many natural phenomena, and that he, according to the most remarkable of its properties, has called ozone, which is sixteen times lighter than oxygen.

This substance can only be obtained from solutions containing it, by means of pure, polished electrodes of gold and platinum, as the easily oxidizable metals, and even carbon, will not evolve it. The solution also must be cold, as heat interferes with its production. Even if one of the easily oxidizable metals, such as iron, zinc, tin, mercury, or a few drops of protochlorid of tin or protosulphate of iron, is placed in oxygen containing ozone the latter will be at once absorbed, and the peculiar odor will disappear. If clean and dry plates of platinum or gold are placed in oxygen containing ozone they become at once positive electric, and remain in this condition for a long time, but lose it rapidly in hydrogen, in which at last they become negative. If we compare the effects obtained by Schoenbein with those of the odorous substance produced by the electric sparks and luminous brushes of our friction electric machines, we become convinced of a perfect identity. If namely, a clean and dry platinum plate is exposed to the electric current flowing from a point, it becomes polarized positively, and the degree of polarization depends from the time that the plate has remained exposed to the flow. That this polarization is not produced only by the electric action, but also to the presence of a substance evolved by the same, is shown by the fact that if the point is made wet the flow of electricity will go on, but the gold or platinum plate will cease to be polarized. The plates thus brought in this condition possess the same properties as those polarized in oxygen containing ozone; in both cases they cannot be brought in this condition when not clean and pure, and in both cases, when brought in a polarized condition, it is changed by heat or by contract with hydrogen.

Schoenbein proposes the hypothesis that as well in air as in water there is present a small quantity of a thus far unknown substance (ozone), either an element or a compound, which can be evolved by electrolytic action. The facility by which this substance is produced, and its decided affinity for metals, compel us to admit a similarity to chlorin, bromin and sodin. If we fail to produce it by means of oxidizable metals, it is because it combines at once with the same, and its disappearance by heat is caused, that this increases its affinity to metals to such a degree that then it can combine even with gold and platinum.

This theory explains therefore easily all the phenomena relating to the production of this so generally diffused substance, which it will be interesting to trace everywhere that its presence may be suspected. The peculiar odor observed always at localities struck by lightning, appears to show that also ozone was evolved. I have had the opportunity to observe this odor when experimenting with atmospheric electricity, while Schouhein reports that he was present when a church was struck by lightning, and that the surrounding buildings, even at a distance, were at the same time filled with a white vapor, which possessed a very peculiar and pungent odor. P. H. Van der Weyde.

Zierzkzee, 30 May, 1841.

Bunsen's Researches—Shortly after the publications on ozone Prof. Bunsen, of Heidelberg, took up the subject and proved that it was not a new element but the result of peculiar actions, perhaps chemical, brought to bear upon atmospheric oxygen, and he thought to have reason for the supposition that it was a higher degree of oxydation of the hydrogen in the watery vapor most always present in the atmosphere, he suggested that ozone belongs to the series which begins with water H_2O, deutoxide of hydrogen H_2O_2, and concludes that it corresponded to the formula H_2O_3 or H_2O_3. His conclusions were based upon the fact that it is next to impossible to exclude absolutely watery vapor during the experiments. If we represent his hypothesis graphically according to the modern method of indicating the bonds of the elements with dashes —, hydrogen being a monad is H—, oxygen as a dyad is —O—, we have for

Water ..... H—O—H

Deutoxide of hydrogen..... ..... H—O—O—H

Ozone according to Bunsen's first hypothesis ..... H—O—O—O—H

or

H—O—O—O—O—H

Later investigations have, however, entirely upset this hypothesis, as practically it has been proved that ozone can be produced where watery vapor or hydrogen is absolutely absent, while theoretical cosiderations confirm the absence of hydrogen in ozone, chiefly for reason of its high specific gravity, which is to that of oxygen as 3:2; while if hydrogen were present, it would to some extent diminish the specific gravity of oxygen, as it does in watery vapor.

The present theory is that in ordinary oxygen its atoms are combined in pairs, represented by O=O, while in ozone three atoms take up the space of two in ordinary oxygen, and are graphically represented by

This belief is confirmed by the discovery of an opposite condition, when the two combined atoms of oxygen are separated and represented by —O— and —O—

This substance has been called antozone, and its presence may be detected by its having different properties, such as the odor which reminds one of boiled lobster; the odo of ozone is like phosphorus, while ordinary oxygen is odorless.

The ordinary oxygen is as an oxidizing agent comparatively inactive, while the ozone is easily reduced to ordinary oxygen: O = O, giving of one atom of active antozone —O—. Also the ioxid of hydrogen does the same. H — O — H gives of one atom of antozone —O— and is reduced to water H — O H.

Ozone O_3 O is considered as a positive electric substance, antozone O —O— as negative, and ordinary oxygen O_2 or O=O as neutral.

(To be continued.)

Fletcher's Sleet-Proof Pulley.

One of the practical and useful mechanical attachments for electric lighting is the sleet-proof pulley of Mr. John R. Fletcher, of Dayton, Ohio.

Mr. Fletcher determined to give the sleet-proof pully a thorough practical test before placing it on sale, and therefore induced several prominent electric light plants to place them last winter where they would be exposed to the most rigid test. The following letters give fully the result:

John R. Fletcher, Dayton, Ohio.

Dear Sir: We have hadforty-five Fletcher's sleet-proof pulleys on our city lights since Nov. 1, 1885. During the past winter we had several very severe sleet storms, wires and ropes being covered with ice, ¼ inch thick. We never had any trouble with your pulleys sticking, and we cheerfully recommend them to light companies doing street lighting.

Champion Electric Light Company,
Springfield, Ohio.

John R. Fletcher, Dayton, Ohio.

We are using 180 Fletcher's sleet-proof pulleys in Kalamazoo and on all lamps at Port Huron. Have never known one to fail in sleet or otherwise. We very cheerfully recommend them.

W. T. Davidson,
Kalamazoo, Mich.

Where Fletcher's sleet-proof pulleys are used, it is impossible for the lamps to be stuck by either sleet or snow, as neither can penetrate the case so as to interfere with the free working of the wheel. The cuts herewith show the pulley complete, and the manner in which it is used. Size, 6x4½ inches; weight, 2½ lbs.

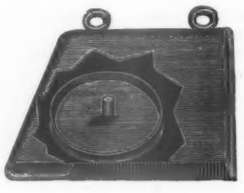


Fig. 1.—Top of Fletcher Sleet-Proof Pulley.

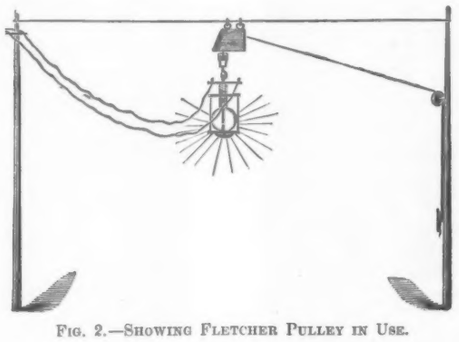


Fig. 2.—Showing Fletcher Pulley in Use.

Lightning Strokes—Causes of the Severe Thunder-Storms of Modern Times.

The researches of Professor Von Petzoid, Karsten Weber, and others, have proved that the number of damaging strokes of lightning has considerably increased during the last fifty years, and this increase cannot be explained by the theory that, owing to the growing number of houses, factories, etc., the number of lightning strokes increased proportionately; to the contrary, this number ought to decrease, as every building, even when not protected by a lightning-rod, effects an equilibrium of the opposite electric potentials, and therefore, the number of lightning strokes ought relatively to decrease with the relative number of buildings. This, indeed, is proved by the fact that in the space of one year among 100,000 buildings there occurred but thirteen cases of lightning strokes in cities, against twenty-three strokes on buildings in the country. We, therefore, have to take this natural phenomenon from another point of view, and to consider the ratio of damaging or other strokes to the number of buildings in a certain district. This ratio, called by the German naturalists blitzgefahr (danger from lightning), increased in the kingdom of Bavaria from 1844 to 1882 three-fold (according to records of insurance companies even five-fold), and other countries show the same increase

As in nature each phenomenon must have its cause, the question arises: To what cause is due the above-mentioned facts? And this question not only is of scientific interest, but also of great practical importance. A great many theories have already been advanced to explain this phenomenon; among others that, owing to the decrease of the woodland, houses are more and more made the projecting points of a certain area, and therefore attract the lightning; besides, this decrease effects a greater rise of temperature in summer, and, in consequence, more numerous thunder-storms. Others find the cause of it in the large increase of such constructions as gas and water-works, weather-cocks, etc. But this theory does not explain why, especially, country houses, which commonly lack these kind of constructions, are mostly exposed to danger from lightning. Admitting that these causes may to some extent explain the increase of danger from lightning, they are not sufficient to fully show the surprising increase of strokes during so short a period. There must be a more general and fundamental cause. Through what can the electrical intensity during a thunder-storm be so strongly increased that a larger number of lightning strokes pass over to the earth than was the case heretofore? It is not so much the increasing number of thunder-storms as their greater force which produces the increased danger.

As the main cause we now point out the enormous increase, during the last fifty years, of factories, railroads, steamboats—in short, of all constructions filling the atmosphere with smoke, vapors, particles of dust of every description. When we consider that every day thousands of locomotives, thousands of steamers go around the earth, that thousands of factories of all kinds daily emit enormous quantities of smoke, vapor, and dust into the air, that, especially in cities, the large number of houses produce immense quantities of smoke and dust, the assertion will not seem incredible that there is certainly 10) times the smoke, dust and gases absorbed in the atmosphere than was fifty years ago. Already with the naked eye the impure state of the atmosphere may be noticed. Go through the coal districts of Manchester, England, through those of Pennsylvania, through the cities of Essen and Pittsburgh, and you will notice a layer of vapor constantly hovering over them; the air is filled with foul gases, and every object is more or less covered with the settling particles of dust.

These conditions being established, we have to consider their relations to the violence of thunder-storms. To give the reader a better conception of this relation we will briefly discuss the theory of the thunder-storm and the origin of electricity thereby developed. Friction is now generally accepted to be the cause of the electricity in a thunder-storm. Friction between air and particles of ice (according to Luvine), or between air and molecules of water (according to Andries), is the main cause of that electricity. When beside these factors particles of dust are filling the atmosphere the development of electricity is highly increased. It is the ejection of steam and ashes common to the phenomenon which causes the thunder-storms attending it to assume an exceedingly violent character. That the pyramid of Cheop is rendered electrical by the whirling dust of the desert may here also be mentioned. It is nothing but the friction of the grains of sand on the surface of the pyramid that causes electricity to originate.

The author of this essay claims that the rapid, enormous and lasting development of electricity during thunder-storms cannot be otherwise explained than by a purely mechanical cause analagous to the mechanical force of the hydro electrical machine. Now, as our atmosphere contains so much more dust than in former years, the fact must be of great influence regarding the intensity of electrical phenomena during thunder storms; from the same reasoning are explained volcanic eruptions. That this increased force of thunder-storms must manifest itself in the greater violence and more dangerous character of lightning strokes, will be evident to the reader. But there is another cause to be mentioned. It is an established fact that air containing solid particles has a conducting power in regard to electric currents far superior to that of pure air. In our day, therefore, where these molecules of dust and solid particles fill the atmosphere to a greater extent, the latter has become a better conductor, and favors a direction of the lightning strokes toward the more impure layers in the vicinity of the earth, and therefore the earth itself.

Barnacles and Blue Drops.

This is a story for telephone people. Go where we will, there is still to be found the telephone Barnacle. He is usually of the male persuasion, but specimens of the opposite sex are occasionally met with.

He is most rare where the toll system is in vogue; say in Buffalo, Milwaukee or other places where every connection counts; where there is laid up against subscriber No. 999 just so much for every time a "Hello Central" follows a fall of the drop.

He is worse where a specific charge of so much per year, hit or miss, whether much or little is done for subscriber No. 999, provided he comes to the center every three months in advance, and doesn't crawl into the telephone and swear, when he calls.

He is worst of all where the toll line is, and No. 999 is a little lenient, or perhaps too busy to stop and ask for what the telephone is to be used, when politely requested by the Barnacle to favor him by loaning it for a few moments.

Then the Barnacle, tricky and sly, asks for a connection with a toll line to Stumptown or Cat Owl Creek, and has the barefooted messenger who does errands for the drug store, run over and ask Miss Calista to come to the telephone and converse with her friend; and she comes, and they converse, regardless of the lapse of time or annoyance to the firm at either end of the line, or how much will have to be paid for the swindle which he intends perpetrating. And the young person at the drug store in charge of the station at Cat Owl Creek, remarks as Miss Calista says, "Good bye—thanks, ever so much," and returns home, "I wonder what she came for, and I wonder what she went away for."

This sort of thing grew at last to such formidable dimensions in some parts of the country that some facile inventor sought for and found a remedy in the prescription known as the "Blue Drop."

The administration of the blue drop has been, and is daily becoming a more certain and popular remedy for the Barnacle parasite. While its action is secondary it is none the less certain because its effects are felt through the medium of subscriber No. 999, or station 111.

In a city somewhere within the reach of a thousand mile ticket out of Chicago, there is a firm which, simply because these are not their initials, we will call X & Z. Like many another large firm there is connected with them by ties of consanguinity a young party who is authority on neckties and casino, who is of the genus Barnacle – species dude, and who, in the absence of the proprietors does much as he pleases about the concern, by virtue of the fact that certain "great expectations in the future" are potent to render him popular on the premises.

The telephone exchange manager at this place is a statistical man. He carries in the breast pocket of his coat a little book full of "how much," "how far," "how many," "how long," and the Lord only knows how many more "hows," collated from his experiences in the telephone business.

He takes now and then a half day at the toll line table. He goes out and sets poles or strings wires, or he visits his subscribers, and puts the results in his little book, which he hides in the breast pocket of his coat.

One day he sat at the toll table, when from X & Z came a request for a toll line connection to Scragg's Bend, which by wire is 35 miles from the spot where X & Z "carry on," as they say down east.

When Scragg's Bend was raised the Barnacle sent for parties with whom he desired to converse; and the fact that these were of the feminine gender, young and susceptible, connected with the fact of the young party's great expectations, filled the office at Scragg's Bend to overflowing, for the three ladies all came, and the office hardly exceeds the dimensions of a mocking bird's cage.

The Barnacle held a mild crust coffee conversation with Miss Carrie, he gabbled with Gertie and he joked with Josie, until his little puddle of small talk having exhausted itself, he retired, remarking as he did so, "charge to X & Z."

And the statistical party, having noted the time consumed, made a little memorandum for the book keeper containing the figures $2.50 at the end of the writing.

When the bill was presented at the end of the month, the spectacled cashier of the firm of X & Z drew a pen through one item, made a memorandum at the bottom of the bill, deducted $2.50, and sent the bill back for correction. With a sort of tornado whirl the other book keeper grabbed his hat and went like a hurricane over to "see about it." While the balance of the bill was paid, there still remained $2.50 charged to the account of X & Z.

Then, with a small pot of water-color paint the inner face of the drop, at the central office, was decorated a beautiful blue. Operators may change, may come and go, but the blue drop tells its own story to each. It says in color vibrations, the rates of which are far above those of sound, "not until the balance is adjusted." The blue drop waited like a worm on a hook, patiently waited, and in a day, or two, or three, there was a nibble. X & Z asked for a toll connection. The blue drop refused. The color said plainly, "not until we get $2.50."

The manager was asked for, and the blue drop again refused the favor.

The superintendent was asked, with considerable warmth, and the request was garnished with considerable force and color, but the statistical party only answered, "your drop is painted blue!"

X & Z rang off.

The toll line operator received a note from a round-bodied director of the company, across whose bay-window chest a massive gold chain meandered like a train of yellow cars on a curved side track, requesting her to give X & Z their toll line connections, and promising to be responsible for the disputed balance.

But the toll line operator only recognizes the statistical party as authority, and to him was the matter referred, and from whom came the reply: "My child, you never mind promises, when $2.50 goes into the money drawer the blue drop will be washedoff—not before, and you cannot afford the responsibility for its payment."

The next morning the drop was washed. X & Z had paid the bill.

The First "Sound" Reader.

Editors Electrical Review:

The following press dispatch is now going the rounds:

James F. Leonard was born in Frankfort, Ky., and began practising telegraphy in 1848. He it was who discovered the art of receiving messages by sound. Leonard began reading messages by ear in the summer of 1848. He was very proficient, and was unquestionably the most accomplished operator that ever handled a key. His record for speed in receiving reached as high as fifty-five words per minute. He came to Louisville in 1849, where he remained until 1861. He then went to Columbus, and the following year fell a victim to typoid fever. Last November Capt. Taylor, who is a member of the "Old-Time Telegraphers' Association," wrote to that body at its meeting in New York suggesting that funds be raised to remove the remains of Mr. Leonard to his native place and erect a monument to his memory. The plan has been carried out, and the monument recently purchased.

The man who first read Morse by sound is gradually assuming the position and filling the vacancy made void by the death of Gen. Washington's body servants. The last of those venerable gentlemen has gone, but one came very near being unearthed a short time since at a minstrel show, where an aged darkey escaped by a scratch. He "didn't jest remember Gawge, but he brought de water fur to baptise his gran'fader, when he was jest a little pickaninny."

The lines from New York to Buffalo, and from this latter place to Lockport, were constructed in 1846-7. The writer hereof was a sound reader, and discontinued the use of paper for conversation that winter, and before him there were those who read by sound to the same extent. Swan, Carter, one or more of the Wood brothers, Sam Porter, did a little at it, and months before the date in the above extract sound readers were quite plenty.

In the other route West, through Pittsburgh, Cleveland, etc, there were several who, coming on the field at about the same date, were picking up sound reading, but, except for conversation, this was positively prohibited on all lines.

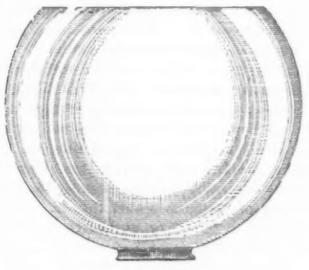
Some of us did more than talk by sound. We drummed musical rythm on the keys, and set others to guessing what tunes they were. There was plenty of time to do all this sort of light work in addition to the legitimate labors of the day—excepting always the cleaning of the Grove battery every night—and get home by early bedtime.

The operators didn't all read by sound, however. There was one faithful laborer, an apprentice to the younger Haskins, who couldn't even say i-i- o.k. without seeing it on a slate he always kept beside him, and, hit or miss, this was his universal answer. He strove diligently to compass the art for six months or so, and at last, with tears in his eyes, gave it up as a bad job.

AN OLD TIMER.

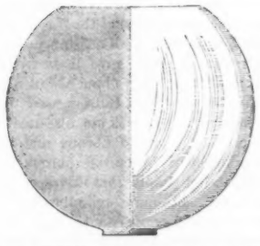
Chicago, Ill., June 5.

*** A "busted" $3,000,000 scheme of one Davis, a Chicago newspaper publisher, to operate in the stock market on Secretary Lamar's decision as to a Government suit against the Bell patent—an advance copy of the decision being obtained by a woman—is the latest curdler reported in the Pan-Electric affair.



CLEAR—14 INCH.

GROUND—12 INCH.



HALF GROUND (VERTICALLY)—12 INCH.

OPAL—10 INCH.

ELECTRIC LIGHT GLOBES OF THE UNION GLASS COMPANY, OF BOSTON.

Electric Light Globes of the Union Glass Company.

The demand for electric light globes has wonderfully increased during the past few years, and the leading manufacturers have greatly improved these very essential elements in good electric lighting, both in respect to diffusion and life. Several varieties of the globes manufactured by the Union Glass Company, of Boston, are shown on this page. Mr. Gregory, agent of this company in Boston, is well known among leading electric light companies, and furnishes globes for all systems. The company he represents is a large manufacturer, and the globes turned out have won an excellent reputation in electric lighting circles.

Book Review.

"Abridgments of United States patents on Underground lines to January 1, 1886." This is an Imperial 16mo. vol. of 344 pages, containing abridgements of all the U. S. patents to January 1, 1886, in sub-class "Underground Lines," together with claims in full, complete indexes, and a digest of 7,000 references. Cloth, price $10. Mail or express. It is by James W. See, of Hamilton, Ohio, Consulting Engineer, Expert in Patent Causes, Member American Society Mechanical Engineers, Hon. Member National Telephone Exchange Association, and a gentleman who stands at the head of his profession.

The underground line business is, so to speak, coming to the surface, and promises to develop an importance hardly measureable as yet. The usual tangles over patents will present themselves, and it of course behooves those interested to post themselves fully, and the opportunity is now presented to do so with readiness. Mr. See has arranged complete official copies of all the U. S. patents on underground lines, and has combined with them complete indexes arranged chronologically and otherwise, together with a digest containing over 7,000 entries, in which each detail, no matter how trifling, is noted under its proper head. Owing to the expensive character of the contents of this publication, taken in connection with the necessarily limited demand for the work, this publication becomes a costly one. To meet this, Mr. See has prepared an abridged edition, in which the same indexes and digest are presented, each patent being represented by a thorough, painstaking and comprehensive abridgement. Our Government has never yet published anything in the way of abridgements of patents, though preparations have been made for the work, which has apparently ended in preparations for lack of appropriations. The British Government has published abridgments of many classes of inventions, but the abridgments have been generally unsatisfactorily brief quotations, the digests have been little more than general indexes. The abridgments presented in the present work present exhibits of everything presented by the patent abridged, whether the matter of reference be found in the drawing or in the specification. The claims are presented in full, and the digest appears as perfect as can be. Nothing appears to have been omitted from the analysis of the various inventions. Those interested will find this work precisely suited to their means in analyzing the state of the art as exemplified by the U. S. patents.

.... Mr. Jesse H. Bunnell, of the electrical firm of Bunnell & Company, has returned from Europe, where the extensive business of his house called him for several weeks.

.... The lines of the Postal Telegraph and Cable Company, located in Ohio, were sold June 10, in the city of Cleveland, at public auction to satisfy the judgments of Campbell Broun and Thomas Fleming. The property was sold in two blocks, and both were bought for Edward C. Platt, of New York. The larger block included the lines to Cuyahoga, Lorain, Huron, Seneca, Hancock, Summit, Portage, Henry, Putnam, Defiance, Ashland, and Trumbull Counties. It was appraised at $50,000 and brought $33,000. The smaller block included the lines in Lucas and Wood Counties, and brought $9,000 on an appraisement of $13,000.

Electrical Review.

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EDITORIAL ANNOUNCEMENT.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Frank M. Gilley, 54 Equitable Building, Boston, Mass., is our New England representative.

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill, will represent the REVIEW in the West.

Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, JUNE 19, 1886.

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The REVIEW is pleased to announce that it has engaged Dr. Geo. H. Benjamin, of this city, as one of the members of its staff. Dr. Benjamin is a widely-known and successful electrical engineer, and his work on the REVIEW will be of particular value and interest to all our readers.

Hon. E. V. Cherry, vice-president of the Standard Electrical Works and a leading alderman of Cincinnati, is spending a few days in the East. Mr. Cherry represents one of the most extensive electrical institutions of this country, and reports the business continually increasing.

The Morrison Electrical Works, of Baltimore, uninfluenced by any request from the employes, have reduced the hours of labor to nine per day, with no reduction in pay. This acknowledgement of their excellent work has greatly pleased the employes and created that friendly feeling that should ever exist between an employer and his workmen.

No one feature of the Electric Club is more popular than the social and informal lunch that is daily enjoyed by about thirty members in private dining parlors at French's newly-refitted hotel. Members of the club quite often entertain their out-of-town friends on these occasions, among recent guests being Mr. J. F. Morrison, of Baltimore, president of the National Electric Light Association; Col. Chas. H. Banes, of Philadelphia, president of the Consolidated Electric Light Company; Hon. E. V. Cherry, of Cincinnati; and Prof. W. A. Anthony, of Cornell University.

The *American Machinist*, of this city, is the leading journal in its field in the world, and its great success is due to the intelligent and wideawake men who have controlled it since its first publication. No exchange comes to us that is more welcome, and no one in the mechanical field should be without it.

Detroit will be honored by the presence of the most earnest electric light operators of this country on the occasion of the meeting of the National Association in that city August 31st. Special arrangements for accommodations are being made, and all who attend will undoubtedly find it an enjoyable and instructive meeting.

We have received a letter from the western shore of our continent, a region which is as inexhaustibly rich in all its resources as its inhabitants are progressive in the most eminent degree. The letter speaks for itself to prove this, and as the subject is one of importance, as well from a practical as from a purely scientific point of view, we handed it to a gentleman who has been a pioneer in this branch of research, like he was in several others, namely, Prof. Vander Weyde, with the request that he give us for publication a full account of what at present is known about this interesting and somewhat mysterious subject. His answer will be found in another part of this number.

We call special attention to the announcement made by the owner of the Sawyer-Man patents on page 15 of this issue. The subject is of such magnitude that we have taken the pains to examine the records therein referred to, and find the statements verified in every particular.

We would commend to the counsel for the Edison Company the perusal of an old law book styled "Ram on Facts," and another styled "Bigelow on Estoppel."

The situation is really too ridiculous for argument, and too serious for a joke.

An explanation might be called a new invention, and then the history will be complete.

THE TELEPHONE SUIT.

There is one point in the telephone controversy, which appears to have escaped the attention of those seeking to set aside the Bell patent of March 7, 1876, viz.:

The patent purports to describe a system of multiple telegraphy, and all the enemies of the Bell Company have invariably insisted that such was its proper construction.

Now, assuming for the sake of argument, that such is the proper construction, what bearing does it have upon the suit brought by the Attorney-General to set aside the patent? No one has ever disputed Bell's right to such a patent, and consequently the suit is not to set aside the patent, but to set aside Judge Lowell's construction of the patent. The Circuit Court, in which the Ohio suit is brought, is of the same jurisdiction as that of the Court in which Judge Lowell sat when he rendered his decision, and hence its finding will be entirely nugatory as effecting Judge Lowell's decision. The Supreme Court of the United States is the only judicial body competent to pass upon Judge Lowell's construction of the patent.

What the various enemies of Bell desire, is the reversal of Judge Lowell's decision—not the cancellation of a patent which they assert is for a system of multiple telegraphy.

EDISON VS. WOODHOUSE & RAWSON.

This action was brought for infringement of three patents relating to incandescent lamps, viz.:

Thos. A. Edison, No. 4,576, Dated Nov. 10, 1879,
J. W. Swan, No. 18, " Jan. 2, 1880.
C. H. Gimingham, No. 4,193, Dated Sept. 29, 1881.

Briefly, Mr. Edison's patent describes a filament of high resistance formed of carbonized fibrous infusible material, connected to platinum leads, and contained and sealed within a glass globe from which the air had been exhausted.

Mr. Swan's patent describes a method of rendering the vacuum within the globe more perfect—by incandescing the carbon filament during process of air exhaustion, and

Mr. Gimingham's patent relates to a method and means for connecting the carbon filament to the platinum leads.

We have carefully read the report of the testimony for the plaintiff, so far as published in our English name-sake, as well as the opinion of Mr. Justice Butt, affirming the validity of the second claim of the Edison patent—which is substantially for an incandescing high resistance filament, of carbonized fibrous infusible material.

No evidence of infringement as regards the patents of Swan and Gimingham having been presented to the Court, these patents were not considered in the opinion.

The issues in the case were firmly boiled down to a single one, viz.: Was Edison first to describe a carbon filament of high resistance formed from fibrous infusible material?

It was in evidence, that in 1878 Mr. Swan in connection with a Mr. Stearn produced a lamp consisting of a glass globe, leading in wires of platinum sealed therein, and supporting a "rod," or, as described by Swan, in 1882, a "filament," of carbon made from carbonized pasteboard. The air being exhausted from the globe, and the whole hermetically sealed (glass sealed). In fact, all of the elements, identically the same, with the single exception that the "rod" or "filament," was not of high resistance.

Mr. Justice Butt gave it as his opinion that the "rod" or "filament" of Swan was not in the sense that Edison used the term, "a filament." It was not disputed that the Swan "rod" was of fibrous material, and when finished, carbonized fibrous infusible material, but simply that it was not of high resistance, although undoubtedly of considerably higher resistance than any previously described incandescing carbon "rod"—still it was not a mere thread—was not given its shape (*i. e.* a spiral or horse-shoe) previous to carbonization, and did not have, by reason of its shape, and size (diameter) the resiliency of the "Edison filament," consequently it was not a "filament" at all.

The learned judge failed to point out where the carbon rod left off and the filament began. This omission is to be regretted, as it is a point which will disturb our minds for some time to come. It's a nice point, and we will not attempt to discuss it until we have read the testimony of the defense. The question of the identity or diversity of the Swan device, does not materially affect the controversy so far as this country is concerned, as Mr. Swan's lamp made in 1878 was not, we believe, described in any publication, and its mere use in a foreign country does not affect the validity of an American patent. The decision, however, places the Edison Co. in rather an anomalous position, in that the claim which they have sustained in England is identically the same as that made in the Sawyer-Man patent, and the one upon which the now pending suit of the "Consolidated Electric Light Company" *vs.* "The Edison Electric Light Company," is based. We refrain from any comments at this time although we hope shortly to take the matter up in detail.

Mr. John H. Vanderhoef, the well-known electrician of the Bishop Gutta Percha Works, died on the 26th ult. Mr. Vanderhoef has been the electrician of these works for twelve years past.

ELECTRICAL NEWS OF THE WEST.

The old saw about the immaculate virgin whiteness of every crows' own young finds application in the electrical line, as in other business. This thought is the outcome of a test of the efficiency of a number of small motors, intended for running fans, sewing machines, rocking babies, etc., each of which is claimed by its legal parent as the best in the market. The tests were carefully made by Mr. Chas. Wirt, and the relative efficiency of three varieties showed 8 per cent., 11 per cent. and 17 per cent. Please don't ask whose these were, because, don't you see, these are not the advertising columns of the REVIEW.

If, as a prominent electric light gentleman once said, the word insulation should be blotted out of the dictionary, what should be the fate of the word "temporary" in its relation to electrical work? If there is an element of danger, a forerunner of unsatisfactory results, a prime cause of unhappiness, it is almost certain to be found in an installation where haste, encouraged by necessity, does miserable work under the plea of "temporary," and forgetfulness or inclination permits this to remain indefinitely.

Were this a sermon, having thus taken the text and introduced the subject in a general way, the preacher would state as heads to the discussion of temporary work:

1. It is faulty on general principle. 2. It is dangerous on principle. 3. It is a bad principle, anyhow and always.

But this is not a sermon.

Nevertheless, the fact remains that in electric light installations the encouragement of what is known as temporary work, in the earlier days of an installation, but which in too many cases, "by a large majority," become permanent, is one of the questions which, by and by, when the electric light convention holds its next gathering, might with propriety be spoken of in the meeting.

The last exposé of the Bell telephone suit is a funny one, and comes near home, inasmuch as Chicago parties are said to be the bottom logs of the scheme. The statement is that certain parties here organized a syndicate to operate in Bell stock, buying or selling according as Lamar's decison should bull or bear the values, and this action would be governed by advance information, which would be furnished the parties two or three days ahead of the general public.

The scheme failed for some reason or other, and of course inquiry was made into the movements which had not panned out satisfactorily.

The *Tribune* of the ninth instant published the result of an interview with one of the parties here, who said:

"My connection with this matter was simply that of a broker who had a pointer and proposed to utilize it. A man came to me in Washington, whose name I cannot give you, and told me he had arrangements made for securing this information. Before I decided the matter I made him give me into positive and conclusive evidence, so that I might rely on the information itself. He gave me the most positive and convincing proof that the information would be authentic. The decision of Secretary Lamar was left in the hands of one of his assistants over night in a room of the Interior Department. The key of that room was handed to an outsider, who was permitted to go there as much as he saw fit, to read the decision and ascertain the conclusions formed by Secretary Lamar, and the instructions, which he proposed to give the law department with reference to the institution of Government suits against the Bell Company. The official who permitted this to be done was a Southern man and not an ordinary subordinate. I had nothing to do with any of these arrangements and only know that the information was secured and in my possession several days before the decision was rendered, and that it was in every particular correct. I operated on this pointer as I would on any other that I thought reliable. We succeeded in forming a pool of considerable magnitude.

"When we came to examine the field of operations we found ourselves blocked. There had been a rumor afloat about ten days before the decision was rendered which knocked the Bell stock down seventeen points in the general market. This fall only represented a little floating stock, and the Boston people, who held the great bulk of the stock, immediately made arrangements to tighten their hold on it, and by combination and concert of action keep up the the price. When our agent got to Boston he found he could sell any quantity of stock in the market, and that it could be sold short in New York and Philadelphia, but it would be impossible to secure a share of the stock for actual delivery. This was a situation we had not calculated upon, for if we had gone into the campaign to sell the stock short, we would have been cornered sure as fate, and instead of making the $2,000,000 or $3,000,000 which we were striking for, we would have lost every dollar we put in. Our intention had been, after selling the stock short and catching the break, to go into the market with $1,000,000, but under the circumstances we were obliged to give it up entirely."

In the same article Congressman Ranney is quoted as saying, relative to the conspiracy:

"We had several intimations that this sort of thing was done, and at one time thought of taking it up in the committee, but our information was that the particulars of Secretary Lamar's decision leaked out through a woman, the mistress of a prominent man in Washington. The uncovering of such a thing would have made a social scandal. It was not wholly pertinent to the resolution of inquiry, so we let it go. The atmosphere of the Interior Department was as thoroughly permeated with Pan-Electric conspiracy as the Law Department under Garland. There were half a dozen Southern men all more or less interested directly or indirectly in the Pan-Electric scheme."

This would seem to be a case where comment is unnecessary, and yet there is possibly a chance for a log school-house debating club to wrestle with a resolution something like this:

"*Resolved*, That that 'ere woman is morally the superior of those 'ere men, generally speakin', in a general way."

The wires and poles in our streets are daily becoming less, and the streets have an undressed sort of appearance, reminding one of a schoolboy without a collar on.

The Chicago Telephone Company has asked a permit to underground its wires along the following routes:

La Salle from Calhoun place to Washington, thence east to Dearborn, south to Jackson, and east to the alley, thence to Twentieth to the alley near Michigan avenue, and south to Twenty-second street; and from Green street to Ashland avenue, on Madison, and thence north to the alley.

The contrast which the removal of the various pole lines shows is illustrated by the remark of a member of the telegraph fraternity, who said a few days since, "Chicago begins to look like a country town. When these wires and poles are all gone the place will be woodsey enough to suit even a Milwaukean."

An Irishman has given a pat description of what he calls the Incanedison light. He says all you have to do is to turn a button and the light comes on a hair-pin in a bottle, but you can't light your pipe by it.

The Union Electric Company, of Chicago, was incorporated on the 10th instant. Capital stock $250,000. Wm. F. Stewart, A. T. Rice, Chas. W. Blattner, incorporators.

The Electrical Supply Company, 117 Randolph street, has just issued a collection of desiderata, which no electric light man can permit himself to be without. Much of the matter has been prepared expressly for this little brochure, and Mr. Terry, the company's manager, is entitled to much praise for his undertaking, as well as the care exhibited in the selection of matter.

Among other things, in addition to the usual comparative tables of gauges, electrical units, decimal equivalents, feet per pound, all of which are none the less valuable because common, there are copies of the New York and Chicago electric light requirements, instructions for making electric light wire joints, etc. H. S. Carhart, Professor of Physics, Northwestern University, Evanston, Ill., contributes a number of tables by which the proper sizes of wire to be used in the various branches of an incandescent installation may be determined. These tables are based on the principle first enunciated by Sir Wm. Thomson that "the greatest economy is attained when the money value of the heat wasted in the conductors equals the allowance for their depreciation and the interest on their cost."

Professor Carhart, in this work, has virtually removed the veil of secrecy which has hitherto hidden the mysteries of incandescent wiring, and placed the whole in such a plain and unmistakable shape that we may not be astonished to see a large increase and a grand boom in the glow-lamp field at the hands of a class who hitherto have been entirely at sea when the question of wiring came up.

This little book contains forty pages of a convenient 12mo. size, and is copyrighted by the Electrical Supply Company, 171 Randolph, of whom further particulars may be obtained.

Col. Lynch, 146 La Salle street, gives the following quotations of telephone stock:

Chicago	$350 @ $360
Central Union	44 @ 46
Michigan	63 @ 65
Iowa Union	15 @ 18
Great Southern	27 @ 29
Great Southern, Script, 90 cents on the dollar.	
Colorado	18 @ 20
Rocky Mountain Bell	40 @ 45
Missouri and Kansas	54 @ 56
Missouri and Kansas, Script, 53 cents on the dollar.	
United	15 @ 17
Cumberland	65 @ 70
Wisconsin	104 @ 106
Bell of Missouri	147 @ 150

CHICAGO, June 14, 1886.

BOSTON ELECTRICAL NEWS.

The Thomson-Houston Electric Company report sales of the following plants: Charlotte, N. C., 45 arc; Newburgh, N. Y., 45 arc, additional; Jacksonville, Ill., 38 arc, additional; Poughkeepsie, N. Y. 195 arc, additional; Troy, N. Y., 135 arc; Beverly, Mass., 30 arc; Long Branch, N. J., 90 arc, additional; Memphis, Tenn., 60 arc; Birmingham, Conn., 45 arc, additional; Clinton, Iowa, 75 arc; Yonkers, N. Y., 150 incandescent; Dodge City, Kansas, 250 incandescent; Lowell, Mass., 300 incandescent; Worcester, Mass, 300 incandescent; Haverhill, Mass., 300 incandescent; Waterville, Me., 60 arc.

The plant at Malden, Mass., will be started in about a week.

The factory of the New York Insulated Wire Company, at Reading, Mass., is to be enlarged and new machinery added in order to enable the company to fill the orders of their increasing business

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An invention in the manufacture of incandescent lamps, which is claimed to be a marked improvement, is a method of filling the bulb of the lamp, after the air has been exhausted, with hydrogen, which forms no compound with carbon at the temperature of incandescense. It has been for some time thought that the presence of oxygen gas in the bulb, although the amount might be very small, is destructive to the carbon filament.

By filling the bulb with hydrogen gas and re-exhausting, the percentage of oxygen remaining can be reduced by repeating the operation to an extremely small amount. But there are two points at which the new process is at fault. The amount of oxygen gas remaining in the bulb after exhaustion depends not only on the working of the pump for exhausting the air, but upon the degree of incandescence employed to drive out the occluded air in the carbon. Again, if any considerable amount of hydrogen gas be left in the glass bulb, and this is the plan of the inventor, we shall find the same deficiencies previously noticed when the bulbs were filled with nitrogen gas—a tranfer of a considerable amount of heat from the hot filament to the glass and connections, thus reducing the efficiency of the lamp.

One of the first features of the arc light noticed by the public was the power of attracting insects. It is reported at Los Angeles, Cal., the number is so great as to fill the globe and obscure the light. The difficulty can be obviated by employing a lamp of such a form that there is no opening for the bugs to enter. An inlet for air should be provided, inasmuch as a portion of the light comes from the burning of the carbons in the oxygen of the air. These openings could be of such shape and so placed that no bug would enter.

White light is composed of red, green and violet lights in a certain proportion. Rays of light beyond the violet have intense chemical effect, and possibly the eyes of insects are so constructed that they can see these rays, which are very numerous in the arc light.

Professor G. H. Hartwell closed a very succes-ful season in the lecture field by his talk on "Civilized Electricity," at Chelsea, June 10. Experimen's with the arc and incandescent light from batteries and a large number of lantern slides added to the interest of the audience.

A company has been formed, so it is stated, to introduce a machine called a "friction heater." A chilled (*sic*) iron plate and cylinder, when pressed together, generated heat by means of friction. If we consider that only 10 to 15 per cent. of the heat in coal is turned into motion by a boiler and engine, this would not seem an economical method of distributing heat, even though we disregard the cost of the motive power plant. It would be more economical to take the steam direct from the boiler for heating purposes.

The bill to incorporate the Winthrop Electric Street Railway Company to use the Enos system at Winthrop, Mass., has at last been reported favorably to the House of Representatives. The committee had reported, recommending that the petitioners be given leave to withdraw, when it was proposed that they take a second trip to New Jersey and examine the system in working order, which was not completed at the time of their first visit. The experimental tests were successful; the car stopping and running forwards and backwards on the steepest part of the grade and curve readily and to the great satisfaction of the committee.

BOSTON, MASS., June 15, 1886.

PORK AND POTENTIAL—A TALE WITH A MORAL.

S. is an enterprising manufacturing point of considerable wealth and large capacity. The manufactured articles shipped from S. are hams, bacon, lard, pork, sausages, and some other minor products of the raw material which comes to S. by various railways and turnpikes that center at that market; and it has been said that only one product of the animal is lost. Everything, from the hoof to the back bristles, and from the nose to that portion of which tradition says at least one whistle has been made—that part of this philosophical investigator which gets through the fence last—all is saved, all is utilized but the—squeal.

The manufacturers of S. are men of experience of rare business qualifications; men who are firm believers in the advantages which the nimble sixpence possesses over the slow shilling. Show them a gain in time, or labor, or thoroughness, and the method is theirs at once; they take it at sight, pay for it in thirty days, and ask for more.

This was how they took the electric light. It was put into the office as an experiment. It went into the cutter's department, as an encouragement and took the form of an enterprise when it invaded the balance of the manufactory, and was charged up to sundries—cash and bills payable at the book-keeper's desk.

The wires went all over the house on what the learned Professor Charley Haskins was once pleased to call drawer knobs. The wire, like a wierd clothes line, meandered over and around that portion of the factory where the last squeal escapes as piggy's foot is unceremoniously jerked upward, and he discovers himself an inverted vertebrate, bleeding to death from a wound in the throat which has seriously damaged his jugular vein.

Just ahead of this in the direction of motion, yet behind it in point of time, there stands a man and a piece of machinery, a combination called the tripper, which serves to tumble the unmanufactured article into a steaming hot bath preparatory to stripping it of its outer bark. Over this tripper and in close proximity to the iron work meandered the pseudo clothes line, imperfectly fastened at rare intervals on the dissimulating drawer knobs.

In the manufacture of the articles enumerated above, time is an element of value and everything moves quickly, in that the manufacturers of S. pay certain of their highest priced artisans in proportion to results accomplished. Men who work by the day take time to stretch—for stretching costs them nothing.

The wintry snow had piled well around the factories at S. and the severe cold chilled the escaping steam until it became dripping icicles at every outside opening. The shrinking of the heavy wire had proved the faithlessness of the hypocritical drawer knobs by pulling one of these loose at an angle in the wire, and dropping it into the snow. It also made arrangements for a future drop in potential at the same point. Inside the house the meandering clothesline conductor severed its connection with another drawer knob, and assumed a catenary curve—Hogarth's line of beauty. The iron work of tripper, with an eye to the practical rather than the beautiful, tangled itself in the pendent curve. Then the subtle force reached out its treacherous hand, ran cheerfully along the iron bolts and rods, and frame of he pen, which was, and is, and ever will be, dark and damp, and dirty.

Then was seen and heard the first act of the parable of the devil among the swine—omitting the finale because there was no sea for them to run into; yet were they hard to ensnare, because of their nervous briskness. And the "sticker," too, felt something besides hog, when he, as he said, "Turned the worst squealer I ever drew a knife on," and had the knife ruthlessly jerked out of his hand, as with a single bound he cleared the pen, where the hogs were howling a phantom chorus, and tobogganing over the floor as lively as skippers in the oldest piece of cheese in the State, regardless of age, sex, or previous condition of servitude.

There was another little cotillion being executed just outside the door, where a pink-haired Frenchman, from County Kildare, to take his own story for it, "seen, that the wire had shlipped off the bureau castor, soir, and set the shnow on fire. An' the more shnow I kicked ontil it, the worse it burned and it knocked me over to the other wire, and shure that fired me intil a shnow bank, and thin it went out, jist, an' I thought I was kilt entirely, so I did."

And when they saw the light was out, the little army with buckets wended its way homeward, and after that came an expert who placed the wayward clothesline on "for good and for true" insulators. And on the morrow the crisp wintry air bore afar and aloft the scream of the factory whistle as of yore, and the army with buckets marched gaily to their sanguinary labors again as if nothing had happened.

Telephonic News

Another Wild Telephone Parody.

A telephone girl in the office one day,
Sang Hello, O, Hello, O, Hello:
Oh! why don't she answer the ca'l right away
Of the Fellow, the Fellow, the Fellow
Who hollers and swears, who cries and who sings,
Who stands at his phone, and screeches and rings,
While the telephone girl to her dude taffy slings?
Oh! its Hello, its Hello, its Hello.

When you want a connection and can't get it quick,
Its Hello, its Hello, its Hello;
You stand at the phone until you are sick,
And you bellow, you bellow, you bellow;
You can holler from evening until early morn,
You're an object of pity, you're sad, O forlorn,
And sometimes you wish you would die and be borne
To Hello, To Hello, To Hello.

*** The American Bell Telephone Company has declared a dividend of three per cent.

*** Mr. Townsend Percy is endeavoring to introduce the Turnbull telephone in England.

*** The schools of Paterson, N. J., are all supplied with telephones, some fourteen in all.

*** About 250 feet a day of the Dorsett conduit is being put down in Brooklyn for the use of the wires of the telephone company of that city.

*** In the city of Pittsburgh the telephone and electric light poles are being painted a clear white. The change is very noticeable. The intention is to paint all the poles and cross-arms.

*** Judges Pardee and Boardman, of the United States Circuit Court, New Orleans, have modified their decision in the case of Bell *versus* the National Improved Telephone Company, allowing the latter company to give bond under the injunction.

*** The Popular Telephone Company has been organized under the laws of New Hampshire, and officers have been elected. J. B. Thurston is president; G. M. Fletcher, treasurer; and John M. Mitchell, clerk. The company owns several patents on acoustic telephones.

*** The City Council of Indianapolis has adopted a resolution allowing the Central Union Telephone Company to keep its poles and wires up until the new company get ready to give service, provided that no new poles or wires be erected, and provided, further, that new telephones be put in when applied for.

*** The American Electrical Works, of Providence, R. I., are meeting with most gratifying success in turning out their Faraday cable. The REVIEW representative, who called there last week, found the works running this department at its full capacity. The telephone, electric light and telegraph people are well pleased with the cable, and quite extensive orders have been received from all these branches of the electrical business.

*** The business of the American Telephone and Telegraph Company has greatly increased at Providence, R. I., since the new long-distance instruments have been put in and the public at that point made aware of the improvement. Several of the leading houses of that city are negotiating with the company for the new subscriber's cabinet, which is a complete and conveniently-arranged desk with the improved instruments attached, and which is to be used for the long-distance talking.

*** Hon. R. P. Flower, of the New York Electrical Subway Commission, has returned from the West where he has been on a tour of observation, inspection, and study of the various systems in operation in cities where the wires have been in whole or in part put under ground. In an interview Mr. Flower said that he was fully convinced of the practicability of putting all the wires under ground, as well as of the desirability of so doing. In Chicago, telegraph, telephone, messenger, fire and police, and all other wires are required to be buried, no new ones being permitted to be stretched above ground. And the buried wires not only give entire satisfaction, so far as their practical working is concerned, but the proprietors find the expense of maintaining them much less, and have ceased all opposition to the reform. The Western Union, Baltimore and Ohio, and the Postal Telegraph Companies each have several miles of buried lines, and find no trouble in working them or keeping them in repair. The telephone, Mr. Flower thinks, works even better under ground than in the air. At least that was his observation on the limited extent of wire afforded for his experiments in Chicago, embracing a circuit of about fifteen miles in extent. He thought that for a great distance there might possibly be a question about this, but for any required distance in this city there would be no difficulty in securing good service by underground wires. Connections are readily made, breaks rarely occur, and the cost of maintenance is purely nominal. The wires are buried about three feet beneath the surface, and manholes are provided at frequent intervals. As to the most desirable system to be adopted here, Mr. Flower was not yet prepared to express an opinion. In Chicago he saw several systems in operation, though that city has now adopted Dorsett's, and all new work is required to be laid under that patent. This embodies a group of wires, each separately insulated and then combined in a cable, which is in turn insulated with paraffine and stretched in insulated tubes of creosoted wood. Mr. Flower is very sanguine that the Commission will be able to adopt a system for New York which will not merely clear the streets of the overhanging wires, but serve the public quite as well, and be as satisfactory to the proprietors of the wires.

*** The Admiralty has granted permission to the Western Counties and South Wales Telephone Company, of England, to connect the torpedo school-ship in Portsmouth harbor with the telephone exchange. It is anticipated that this will prove a great boon, as the *Vernon* is in communication with the other harbor vessels, and subscribers will be able to speak through to them. The members of the Royal Naval Club will, no doubt, find this extremely convenient. Considerable progress has been made of late in connection with the exchange, and it is probable that before very long a hundred members will be on the books.

The Shaver Telephone System.

Centuries ago, before the word telephone was known, before the pulse of the telegraph had commenced its wonderful beating; aye, before the locomotive, or even steam had made its power felt, the underlying principle of the mechanical telephone was known, and we hear of its use to enable keepers of condemned prisoners at the time of the inquisition to overhear conversation within the cells by means of a diaphragm of parchment inserted in the prison walls, connected by a string with another similar diaphragm in an adjacent apartment. Later, the principle became more widely known in the operation of the "Lover's Telegraph," so called, which consisted of two cups, with one end covered with tightly-stretched parchment and a string connection between the two, as in the former case. No improvement upon this device is recorded for a period of over two hundred years, no one appearing to think it could be extended in application, and what now seems more strange no one seems to have anticipated that such application would be desirable, or have any great field for use were it accomplished. Not until the invention of the electric telephone does it appear to have received any attention or development; but as soon as the great commercial advantages of the telephone were apparent, inventive talent was turned toward the "Lover's Telegraph." Many attempts were made, but all proved comparative failures, as with each improvement new obstacles arose, and the necessity of a high state of tension in the line wire, and loss of the vibrations at angles, and the Æolian-harp effect caused by the wind upon the wire for a long time seemed insurmountable, and the acoustic or mechanical telephone became a synonym for worthlessness. It is curious to look through the patent records upon this subject. Over sixty of these so-called telephones were patented between 1878 and 1884.

FIG. 3.—SHAVER ACOUSTIC TELEPHONE.

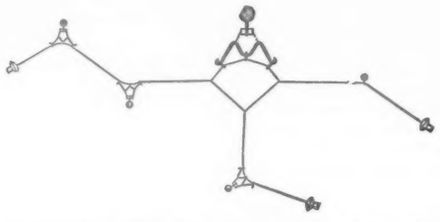


FIG. 2.—SHOWING METHOD OF CONNECTING TO TRUNK LINE.

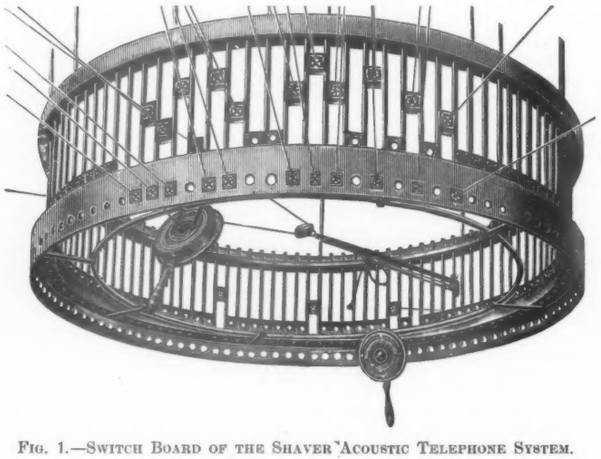


FIG. 1.—SWITCH BOARD OF THE SHAVER ACOUSTIC TELEPHONE SYSTEM.

During the year 1878, Mr. Shaver completed a device for enabling the deaf to hear the ordinary telephone through the teeth. Since 1879, however, Mr. Shaver has confined himself principally to the development of the mechanical telephone system which bears his name, description and engravings of which are given herewith.

Upon entering the office of the Consolidated Telephone Co., at the corner of Cortlandt and Greenwich streets, the first thing that strikes the beholder is a number of wires concentrating upon a peculiar-looking chandelier-like device depending from the ceiling, within which the operator stands. This is the exchange switching frame, and all lines are brought to it from the outside world, like the spokes of a wheel to the hub. Each line terminates at a cross of supporting wires, and a short piece, equal to one-half the diameter of the frame, hangs loosely therefrom, terminating in a loop. When a connection between any two lines is desired, these loose ends of the line terminals are brought together at the central point within the frame. There they are connected together through a diamond-shaped device carrying hooks, and a slight tension is put upon the wires by an apparatus consisting of tubes, one sliding within another and carrying blocks for setting the tension. A hand phone, shaped like an ordinary hand looking-glass, enables the operator to connect with any subscriber without loss of time. The line terminals are vertically adjustable upon bars, which enable a number of connections to be made between different subscribers at the same time without interference. Instead of the ordinary one sided conversation which one hears in an ordinary telephone central office, the answers are almost as audible as the operator's voice, such is the power of transmission, but when two subscribers are connected no sound is audible from either line, unless the operator connects his phone, when the conversation of the connected subscribers becomes audible all over the room. One would naturally conclude that the person communicated with had taken up his abode within the telephone box, so clear and loud is the annunciation. The telephones are somewhat larger than the electric telephone cases, and are octagonal in shape, resembling the common wall clock, and the apparatus, although appearing complicated by reason of the number of wires seen in the room, is in reality simplicity itself; and, as each line terminal is numbered, no difficulty is experienced in locating the subscribers, and the connections are as easily controlled as by the ordinary switchboard of an electric apparatus.

Throughout the entire apparatus no electricity or magnetism is used, and the spectacle of a complete telephone exchange system operating by means of the vibration of metals alone, is novel in the extreme. Nothing of the kind has ever been brought out before, and the new and peculiar shaped devices for operating and controlling the vibrations are very interesting. This system has been adopted by the Lehigh Valley, New York, Lake Erie and Western, Pennsylvania and other railways, and plants have been recently put in for many prominent private corporations, among them being the Brush Electric Light Co., and Variety Iron Works, of Cleveland, Carnegie, Phipps & Co.'s Steel Works, Homestead, Pa., the Aultman & Taylor Co., of Mansfield, Ohio, and many others. The exchange at the company's headquarters has lines running to it from different points in the lower part of the city, ranging in length from a few hundred feet up to three-quarters of a mile. The cost of construction and maintenance of this system is much less than that of any electric system. The small cities and towns that are not large enough to support an electric telephone exchange, will do well to consider the claims of this telephone. The managers claim that they can operate as high as 200 subscribers.

The Electric Tower of Paris.

Paris—and that means France—is to have a universal exposition, or world's fair, in 1889, the centennial of the first revolution, of the downfall of the Bastile, of the first breath of republicanism.

As an attraction, a gigantic tower is to be constructed on the Champ de Mars, nearly 1,000 feet in heigat, all of iron, a rectangular pyramid in shape, bearing at its summit a huge electric light within a glass inclosure, and having a balcony for the use of the visitors, who will be transported from and to the earth proper by means of an elevator.

From this high outlook the daring investigator will command a panoramic view of eight miles radius. It is expected the light will be visible on clear nights as far as Dijon, 197 miles by rail towards Neuchatel. Dijon may be known, as somebody once said, by the black image of the Virgin which is found in its church of Notre Dame, and its being the center of the wine trade of upper Burgundy.

At an altitude of about 225 feet from the earth—higher than the towers of Notre Dame—two and a half miles or so to the east, there will be installed a restaurant, where one can probably dine as cheaply and be as long at it as at the Grand Hotel, provided the trembling of the grand tower in the wind does not produce the same effect as is ordinarily found between Dover and Calais.

It is expected that meteorological and astronomical observations will be possible from its summit. If the weather—but then they don't have cyclones over there, several dozens in a case, and a fresh invoice every spring, as we Americans do.

Six thousand six hundred tons will be the avoirdupois of this little skeleton pyramid, twice as high as those of Egypt, or our own dear Washington monument, and the estimated cost $200,000. The inventor, M. Eiffel, demands, to cover the expense of construction, that he shall be entitled to the admission fees for the first ten years of its existence. The genuine Frenchman is an economical cuss, as well as modest in his demands.

One use to which the tower may be put is not mentioned. It will for that purpose discount both the Arc de Triomphe and Notre Dame, leaving the dome of the Pantheon far out of sight. For a sensational suicide the Centennial tower of M. Eiffel can't be beaten.

OUR BELGIUM LETTER.

[Special Correspondent ELECTRICAL REVIEW.]

In connection with the subject of propulsion of tram cars by electricity it is to be noticed that an electric tram car is now in successful operation at Hamburg (Germany). We understand that is the same system that so well proved at the Antwerp Exhibition, under the patents of Mr. E. Inliers, the general manager of the Société l'Electrique, of Brussels.

Three lines of the Tramway Company of Brussels are now being organized to use the secondary batteries tram car; fifteen cars should be running in a few weeks, and it is predicted that this electrical system of propulsion shall be extended shortly to the other lines of this city.

We are told that the same system shall soon be ready for operation in the United States, and the coming season will see some lines of electric tramways worked by accumulators in Italy; several parties are now negotiating for this purpose.

The ultimate success of electric tramways, by means of secondary batteries, is actually assured beyond a doubt for street traffic.

The business of electric lighting from a central station is seriously engaged at Brussels. The vicinity of the Gare du Nord is to be lighted by incandescent lamps, Lane Fox lamps and Victoria dynamos will be used in accordance with Brush system for arc lights; the installation is provided with storage batteries in order to supply lights to the customers at every hour. The plant starts with a capacity of 800 lights, 16 candle-power, and supplies to hotels, restaurants, shops, works, and private houses. Facilities could be very easily increased.

In the same city the Grand Hotel shall be lighted for the autumn by 300 incandescent lights and Siemens & Halske have undertaken the plant of electric lighting of an important coffee house with 170 lights.

Other plants of valuable importance are in negotiation.

Yesterday the exhibition of apparatus of lighting by the wires of the Société des Ingénieurs et Industriels at the Bourse at Brussels was opened. This is very interesting; there are exhibited a great number of various specimens, from old oil cups from Roman people, the candle grease, guenquets and carcels, to the last improved burners. Gas light is well represented, and as it meets a very dangerous competitor with petroleum, this last shows numerous lamps and burners of all kinds. Electric light is shown only by a company, but although the new illuminant is considered here as young it proves the best.

In a next number I shall be able to give a detailed description of this exhibition, that shows the actual progress of lighting in Belgium. A. A.

Belgium, May 29th.

Choice of Metals for Conductors.

M. E. Bède, lecturing before the Belgian Society of Electricians on the choice of metals for the wires of telegraph and telephone lines, observed that since the achievements of M. Van Rysselberghe, telegraph lines must not be considered separately from telephone lines. M. Eric Gérard, in his recent lecture before the Society at the Montefiore Electro-Technical Institute, pointed out that in accordance with Hughes' experiments in self-induction, and those which he himself had conducted at the Electro Technical Institute, that to transmit equally for an alternating current with very short undulations, like telephone currents, iron wires must be employed of a slightly larger diameter than that of a copper or phosphor bronze wire of high conductivity. Consequently, the weights of the two lines in iron and in phosphor bronze—equally good for telephonic transmission—would be in the ratio of 32 to 1, and as the price of galvanized iron wire is more than one-eighth that of the bronze, it follows that a line laid with iron wire would cost at least four times the amount of an equally good line in phosphor bronze wire of high conductivity, without taking into consideration the fact that, being thirty-two times heavier, it would require much more costly supports and labor. From the beginning of telephone exchanges M. Bède had adopted for the wires the phosphor bronze of M. Montefiore, and the results had always been excellent. Now almost all the telephone companies had followed this example, and it had been found possible, with phosphor bronze wire of great tenacity, to span whole valleys of 800 metres (875 yards) without intermediate supports. On the conclusion of the remarks by M. Bède, M. Banneux, Inspector of the Belgian State telegraphs, declared that this administration has decided to replace all the iron wire lines as they became defective by those of phosphor bronze, and had already given some large orders to M. Montefiore. M. Van Rysselberghe then declared that, judging by his experience in America, it was not possible to establish good telephonic transmission to long distances by means of iron wires, while with those of copper excellent results were obtained. It was thus that he was not able to correspond properly at a distance of 250 miles by means of iron wire of 4½ mm. diameter (No. 8), while he corresponded perfectly well from New York to Fostoria, a distance of 730 miles, with a hard copper wire of 2.7 millimetres, and from New York to Chicago (1,010 miles) with a compound wire, formed with a steel core of three millimetres, surrounded by a thickness of 1.5 mm. of copper, corresponding to a 5 mm. copper wire. It was certain that communication could be established by telephone with such a wire at 2,000 miles distance, so as to give commercially satisfactory results.

The Telegraphers to Join the Knights of Labor.

A press dispatch from St. Louis says that a secret meeting of the delegates to the Brotherhood of Telegraphers was held in Kansas City, Mo., on the 11th. The delegates were from all parts of the United States, and several of the most prominent were those who were active in the great telegraphers' strike of 1883. Ever since that time the fraternity have been quietly organizing upon a sound basis, but they have found it necessary to be very cautious in their movements, and it was for this reason that the convention was held with such secrecy. The meeting was harmonious throughout, and a large amount of work was accomplished. Heretofore the Brotherhood has been an independent organization, the various local councils formulating such rules and by-laws as were deemed necessary for their proper government. The rapidity, however, with which the organization has increased of late has made it necessary to more thoroughly systematize the working of the separate councils under a general head. It was for this purpose that the convention was called, and, after mature deliberation, it was unanimously resolved to fall in line under the banner of the Knights of Labor. This was the principal business of the meeting, and after it was completed the convention adjourned *sine die*.

....Captain Anderson, of the British bark Siddatha, which lately arrived in New York, reported a peculiar thunderstorm on April 27, while on the northern edge of the Gulf Stream. The day was quite clear at the time and the sun shining brightly, although there appeared to be a thin mist about the ship. Suddenly there appeared a vivid flash of lightning, accompanied by violent thunder. The compass was caused to vibrate perceptibly for a period of fifteen minutes.

.... The directors of the Western Union have decided to pass the dividend for the quarter ending June 30. The net earnings for the current quarter, partly estimated, were $1,000,000, against $1,400,000 for the corresponding period in 1885, and $1,750,000 in 1884. After paying the amounts required for interest and sinking fund a balance is left of $856,385. A dividend of 1¼ per cent., such as was declared for the corresponding quarter in 1885, would require $1,199,841. The commercial and news business increased, but there was a falling off in the revenue from cable business and the commercial news service. This is said to be the first time in many years that the Western Union has failed to pay a dividend. Not long ago it was paying at the rate of 7 and 8 per cent. per annum. The existence of strong competitive telegraph and cable companies which have refused to be bought up or to enter into rate arrangements with the Western Union, is said to be the direct cause for passing the dividend.

.... With a view to obviate inconveniences caused by the multitude of telegraph wires at present suspended on poles in the streets of Sydney, Mr. E. C. Cracknell, superintendent of telegraphs for New South Wales, proposes the adoption of a new plan. By this system it is proposed to remove the wires from mid air and to inclose them in a case resembling a frieze, to be placed close to the buildings. The frieze will be supported by pillars sunk in the ground 4 ft. 6 in., and 14 ft. 6 in. in height. Connecting these pillars are cast-iron beams 18 in. wide, called friezes, and behind them are to be placed eight racks for holding cables, which are clusters of fifty wires embedded in an insulating substance, and coated with cement. They make a cable of 1 in. in diameter. It is estimated that the rack will hold 400 wires easily. On reaching the street crossings the racks will be made to descend to the level of the road, and will be carried underground to the other side, where they will rise to the previous level. A section of the new line is about to be erected in George street. The probable outlay is estimated at £5,000.

TELEGRAPHIC

.... License of incorporation of the United Wire Company, at Chicago, have been issued by the Secretary of State; $100,000 capital stock; Ebin J. Marsh, Hiram Scott and Charles J. F. Knight, incorporators.

.... Norwalk, Conn., has decided to have a complete fire alarm system, and has contracted with General Agent Chas. A. Rolfe, of the Gamewell Company, for a Gamewell non-interference system. Five miles of wire, five gongs, seven boxes, and a tower bell striker comprise the plant.

.... A fac-simile telegraph dispatch was recently sent out by a Buffalo fish dealer as an advertisement. One was received by a young bride of six months, whose husband was out of town. She at once concluded that he had met with an awful accident, and so went into hysterics. Servants were sent to her parents, who found her still too much unnerved to open the envelope and learn the terrible facts. She recovered with remarkable celerity when the news that fish were cheap was gently broken to her.

.... The proceedings in the House of Commons, Monday night, June 7th, were a culminating point in one of the most remarkable and memorable epochs in the history of Great Britain. That the Associated Press was fully alive to the importance of the occasion, and had resources entirely adequate to cope with it, is evidenced by the results achieved. Bulletins announcing the defeat of the Gladstone Government and the vote by which the second reading of the Irish home rule bill was defeated were sent to its constituents within a few minutes after the facts became known in the House, and these were followed by cable dispatches, and sent to all points over its leased land lines, giving practically verbatim reports of the great arguments of Gladstone and Parnell extended summaries of the other speeches and graphic descriptions of the exciting scenes in and about the House, making, in all, about 25,000 words. The noteworthiness of this achievement is increased by the fact that the report covered a night session lasting till between 1 and 2 o'clock in the morning, and that it was delivered to the papers of the Associated Press in time for publication the same morning.

.... A lineman, named Joseph Cassell, had a narrow escape from death in this city, last week, through the breaking of one of his spurs, while he was fixing some wires on a 60-foot telegraph pole. He crashed downward through the network of wires and landed astride the second crosstree. The force of his descent was so great that the strong bar of wood snapped off short. The obstruction proved sufficient, however, to give him a chance to throw his right arm over a number of the wires, and in this way he hung, supporting himself as well as possible on the left by clinging to the stump of the crosstree. He had hurt his left leg badly in his fall of six feet from the top crosstree and, as he swung in the air forty feet above the pavement, his wounded leg became entangled in some of the lower wires and was badly strained. George Fitzgerald, another lineman, came rushing to the pole and went up in lively style. The crowd below sent up cheer after cheer as they saw help coming nearer to the young lineman. They become disappointed, though, when they saw Fitzgerald pass by the dangling form of his friend and climb up to the top crosstree. In a moment, however, they saw his purpose. Dexterously and swiftly he fastened one end of the rope around the pole and crosstree. Then he formed a slip noose at the other end, and, climbing down, drew it over Cassell's body up to the arm pits, and held him safely until, with the aid of firemen's ladders, he was landed safely on the ground. Linemen should always look well to their spurs.

ELECTRICAL AND SCIENTIFIC

* * A man industriously engaged in cutting telephone wires was observed on the roof of the four-story dwelling, No. 923 Wallace street, Philadelphia, on Tuesday night. It was Harry Hendricks, the occupant of the house, who was acting under the instructions of the landlord, William Petit. Before Mr. Hendricks finished he had cleared the roof entirely of the wires, and upward of 100 were dangling on Wallace street on the south and in the adjoining yards on the north. The wires were the property of the Baxter Overland Telegraph and Telephone Company, and have been inoperative since the Bell Telephone Company's injunction compelled the Baxter to quit business.

* * There has been introduced in the House of Delegates of St. Louis, a bill authorizing the construction and maintenance of an electric elevated railway, double track, standard gauge, with sidings, turnouts, and buildings. The franchise is asked by Thomas O'Reilly, his assigns and successors. The termini of the road will be at Fourth street and Forest Park, the distance between being about four and a half miles. The bill provides that the road shall be constructed as nearly as possible over the middle of the streets, upon machine-wrought iron, and the motive power shall be electricity only. Mr. O'Reilly says that Eastern capitalists will furnish the money, and will commence the construction of the road within a week after the passage of the bill.

Concerning Mr. Woodbury's Statements.

Editors Electrical Review:

I have read with interest Mr. Woodbury's article on Electrical Elevated Railways, published in your last issue. It is the only truthful statement that I have seen, and I am happy to find one man sufficiently truthful and fearless to state the facts as they exist.

Dozens of companies have promised us electric locomotion. We have been told time and again that Smith's or Black's motor was all that could be desired, and that in a week or so they would commence to operate cars. I have waited patiently, and am still waiting. Why is this? It occurs to me that there is considerably more "engineering" done to sell the stock than to devise means for practically operating the electrical devices. ENGINEER.

An Electrical Submarine Boat.

Secondary batteries furnish the motive power for propelling Goubet's submarine boat illustrated on this page, and the electromotor is calculated to give her a speed of 5 knots an hour. The cells number 30, 6 of which are used as a reserve. The motor is a Siemens dynamo of the type applied to tramways; it weighs from 180 to 200 kilogrammes, and works with an E.M.F. of 48 volts and a current of 8.8 amperes. Under these conditions the boat is provided for for 10 to 12 hours. In the case of submarine explorations it might be worked during submersion by the generator of the vessel to which it would be attached, by means of the electrical transmission of power. The torpedo is placed in the rear of the hull. The transmitting wire is coiled on a drum outside, and is connected with the commutator placed under the hand of the officer. In the forepart, a cutter, which is enabled by means of the lever *T* to project from the boat for a length of 3 metres, serves to cut the wires of the torpedoes of defence; it is lighted by an incandescent lamp.

On arriving underneath the vessel to be attacked, which can be seen through the headlight, the officer works a pump in order to get vertically underneath, and the releases the torpedo, which ascends and attaches itself to the hull of the vessel by means of grapplers. The boat then recedes, the wire coiled round the drum unrolls and at the same time indicates the distance traversed. When this is sufficient, the officer effects the explosion. Then the boat ascends to the surface by emptying the reservoirs and regains the vessel to which it belongs.

The boat can be kept in communication with the principal vessel, either by means of a telephonic wire if it remains near, or by means of rockets.

Electrical Measurements.

[Specially prepared for the REVIEW.]

The promulgation of the doctrine of the "conservation of energy" taught many useful lessons, not the least of which was that all science must be based upon exact and minute measurement, thus causes and effects may be truly balanced and their action and reaction traced from point to point.

The ancients, so far as is known, had neither any idea of, or means for, measuring anything but ponderable substances. Steam, the gases, electricity, and the like, were not understood, and were not supposed to bear any definite relation to anything in particular—and were considered mere manifestations of nature—erratic forces, phlogiston, and what not, which as their effects were not within the control of man, and often more productive of evil than of good, were attributed to the wrath of the Gods. With such as the general belief, it is not to be wondered at that few, if any, attempts were made to understand such forces, much less to measure them. Ignorance begot the superstition of the ancients, which superstition, so far as electricity is concerned, still, in a measure, exists.

A created force to the ignorant is a "something" derived from nothing—got for nothing—hence any scheme based on the get-something-for-nothing idea, such as the Keeley Motor—cold vapor engine—non-exhaustible battery, etc., finds many believers and victims.

Scientific men for the past fifty years have been endeavoring to teach the great truth that no force can be created, that energy in some form must be expended to get a return in some other. In order to prove their assertions and in order to show clearly the correlation of the forces, it was necessary that some system of exact measurements be adopted. Up to 1850 no system had come generally into use. Every country of Europe, as well as each individual experimenter, had some sort of a system of his own. Hence, hopeless confusion reigned. There could be no communication of ideas, and in order to bring order out of chaos, the British Association, in 1863, appointed a committee of the most eminent electricians of Great Britain to fix upon a standard of electrical measurements, directing them to use the so-called "Metric System" (Centimetre Gramme Second) as a basis for their determinations, and this chiefly for the reason that the metre (39.37 inches) was supposed to bear a definite relation to the forty-millionth part of the length of the terrestrial meridan, and had the further advantage of the decimal system being multiples of ten.

After eight years of continuous labor, the committee reported a system which has since been known as the B. A. System of Units. In 1881 the conference of electricians at Paris slightly modified the finding of the British Association Committee, and suggested a system of units which were adopted, and are now known as the "Legal Units." All scientific, electrical determinations, and instruments are now based on these units. The units are divided into two classes—*Absolute Units* and *Practical Units*—and each into a number of sub-classes.

FORMULÆ OF THE ABSOLUTE UNITS.

1. *Fundamental Units.*

L — Length or space = 1 centimetre.
T — Time..... .... = 1 second.
M — Mass..... = 1 gramme.

2. *Derived Mechanical Units.*

1 — Velocity ... $V = \frac{L}{T}$

2 — Force..... $F = \frac{L\,M}{T^2}$

3 — Work..... $W = \frac{L^2\,M}{T^2}$

3. *Derived Magnetic Units.*

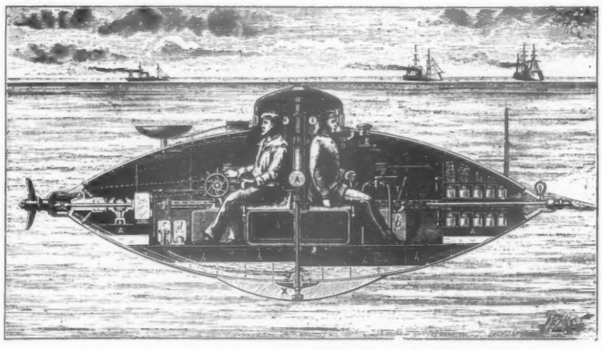
Strength of the pole of a magnet $m = L^{\frac{3}{2}}\,T^{-1}\,M^{\frac{1}{2}}$
Moment of a magnet.... $m\,l = L^{\frac{5}{2}}\,T^{-1}\,M^{\frac{1}{2}}$
Intensity of a magnetic field $H = L^{\frac{1}{2}}\,T^{-1}\,M^{\frac{1}{2}}$

4. *Electro-Magnetic System of Units.*

Quantity of electricity..... $Q = L^{\frac{1}{2}} \times M^{\frac{1}{2}}$
Strength of electric current.. $C = L^{\frac{1}{2}}\,T^{-1}\,M^{\frac{1}{2}}$
Electromotive force ..... $E = L^{\frac{3}{2}}\,T^{-2}\,M^{\frac{1}{2}}$
Resistance of conductor..... $R = L.\,T^{-1}$

5. *Electro-Static System of Units.*

Quantity of electricity.. $q = L^{\frac{3}{2}}\,T^{-1}\,M^{\frac{1}{2}} = v\,Q$
Strength of current..... $c = L^{\frac{1}{2}}\,T^{-2}\,M^{\frac{1}{2}} = v\,C$
Electromotive force..... $e = L^{\frac{1}{2}}\,T^{-1}\,M^{\frac{1}{2}} = \frac{E}{v}$



GOUBET'S ELECTRICAL SUBMARINE BOAT.

Resistance of conductor . $r = L^{-1}\,T = \frac{R}{v^2}$

v = 310,740,000 meters per second, approximately, the ratio of the electro-static to the eletro-magnetic unit of quantity.

Unit of Force (Dyne) is the force which would produce, in a body weighing one gramme acting on it for one second, a velocity of one centimetre per second. Calling gravitation the natural unit of force = 981 cm. per second, the absolute unit of force will be $\frac{1}{981}$ T; part of it, or $\frac{1}{981}$ of a gramme, acted upon by the earth's attraction, or the weight of $\frac{1}{981}$ gramme.

Unit of Mechanical Effect is the unit of force carried up through one gramme centimetre, or $\frac{1}{981}$ raised one centimetre.

Unit of Mechanical Performance is the unit of mechanical effect or work performed in the unit of time, or $\frac{1}{981}$ gramme raised one centimetre in one second.

FORMULÆ OF THE PRACTICAL UNITS.

1. *Ohm* symbol *R*

Unit of resistance = 10^9 C.G.S. units.
Dimensions of unit $L\,T^{-1}$.

The ohm is the resistance of a column of mercury of a square millimetre cross section and 106 centimetres in length at the temperature of melting ice—or resistance of copper wire 95 per cent. conductivity—10 feet long, $\frac{1}{10}$ inch in diameter, weighing 2 grains per foot.—R = E ÷ C

Meg-ohm = 1,000 ohms.

2. *Volt* symbol E

Unit of electromotive force = 10^8 C.G.S. unit
Dimensions of unit $M^{\frac{1}{2}}\,L^{\frac{3}{2}}\,T^{-2}$

The volt is the electro-motive which maintains a current of one ampere in a conductor, the resistance of which is one legal ohm—

Daniel's cell = 1.079 volt.
E = C × R.

3. *Ampere*, Symbol *C.*

Unit of current strength = 10^{-1} C. G. S units.
Dimensions of units, $M^{\frac{1}{2}}\,L^{\frac{1}{2}}\,T^{-1}$.

The ampere is the current of one volt (10_8) through one ohm (10^9) = 10^{-1} in electro magnetic units. = The current required to electrolyse .00142 grains of water.

C = E ÷ R.
C × one hour = ampere hour.

4. *Coulomb*, Symbol *Q.*

Unit of quantity = 10^{-1} C. G. S units.
Dimensions of unit, $M^{\frac{1}{2}}\,L^{\frac{1}{2}}$.
Unit of quantity—one ampere for one second Q = C T.

5. *Farad*, Symbol *K.*

Unit of capacity = 10^{-9} C. G. S units.
Dimensions of unit, $L^{-1}\,T^2$.
K = Q E.

Micro-farad = 1 millionth of a farad. The capacity of 3.5 miles of average telegraph cable.

*6. *Joulad* (Erg.) Symbol *J.*

Unit of energy = 10^7 C. G. S units.
— Work done in the circuit = 7373 foot pounds.
J = C^2 × R.
* Not yet adopted.

*7. *Watt*, Symbol *W.*

Unit of power = 10^7 C. G. S units.
Work done in one second of time.
W = E C = horse-power .000134.
746 watts = I. H. P.
* Not yet adopted.

8. *Volt-Ampere*, Symbol *none.*

Has not been adopted, but is coming into use in connection with electric lighting = 3-600 joulads.

Standard of Light.

No luminous unit has as yet been adopted. The so called standard candle is in use, as likewise the Carcel lamp. The French Stearine candle (called L'Etoile) weighs one-fifth of a pound, and burns at the rate of 7.60 grammes per hour equal to about one-eighth of a normal Carcel.

Spermaceti candle = .087 Carcel.
Paraffin " = .1 "

Electrical Notes from Philadelphia.

It was expected that the sub-committee appointed by councils to report on Thursday evening, of last week, upon the bill for the laying of underground wires in this city, would in some way arrange to have the ordinance satisfactory to all companies that came within the scope of such a law. But the committee were unable to agree upon anything definite, and when the original bill (which was given in the REVIEW of May 29th) was recommended, the different companies refused to accept it, so the matter of underground wires rests in "status quo." The City Councils in the meantime have given permission to the People's Telephone Company to construct overhead wires for the establishing of their central station; also to the electric light company to extend their pole line. Everything seems to indicate that nothing definite will be accomplished in underground work here during the coming summer. Mr. Gill, superintendent here for the Western Union Telegraph Company, in speaking of their company going underground, said that "if the city would 'plant' their wires and demonstrate to them that the system they use is a success, they would immediately follow, and put all their wires underground."

It has been decided to extend the electrical railroad on Ridge avenue up to the park entrance. The success which has attended the short experimental line has brought about this determination. The laying of the cable for the city on Columbia avenue is progressing rapidly. This cable was made by the Standard Underground Company, of Pittsburgh, and the laying is being made under the direction of Chief Walker, of Electrical Department of the city. Last week I mentioned the fact of the visit of Buffalo citizens to examine the patrol system of this city. This week Montreal sends a delegation to look into the system, with the idea of adopting it for its use.

The Peoples' Telephone Company, of this city, have been incorporated, with a capital stock of $200,000. They have an acoustic "phone."

The Southwark Engine Company have just finished a number of their engines, to be used in connection with electric lighting in different parts of the country.

Palmer, Cunningham & Co., the machine and toolmen, who were formerly with the firm of Tallman & McFadden, have taken the store formerly had by the old firm at 607 Market street. They will keep a full line of the best make of tools, and we bespeak for them all the success that their industry merits.

The Edgerton Motor Company is being reorganized. The company will be composed largely of Philadelphia citizens, and, if expectations are realized, a large business will be done the coming summer.

PHILADELPHIA, June 14.

Electric Lighting in Hornellsville, N. Y.

[From our Special Correspondent.]

When the American Illuminating Company, of Hornellsville, notified the Board of Trustees, two weeks before the first of June, that official action might be taken to inform the gas company that the supply of light from the gas lamps should be discontinued on that date, the numerous oldest inhabitants turned from prophesying about the weather to predicting that they knew the plant could not be made ready in a month. The station, situated on Hill street, is supplied with tubular boilers, furnished with Jarvis setting. The motive-power is supplied by two 60 horse-power Armington & Sims engines, furnished by the Jarvis Engineering Company. All the most improved attachments—feed-water heaters, injectors—are provided. The boilers and furnaces are in charge of Mr. George Wood, formerly with the gas company. All parts of the work—wiring, placing lamps, setting boilers and engines—proceeded simultaneously, and on the evening of June 1 twelve of the 55 lights contracted for were lit, but the full numbers were soon in place, to the great satisfaction of the inhabitants. At an early date the depot and yards of the Erie Railroad Company will be lighted by arcs from this station. No lights have yet been placed in stores, as the company are not ready as yet to supply them. The number of stores is large, as the trade for miles centers here. Mr. S. H. Crane illuminates his house by electricity; a Thomson-Houston dynamo furnishes the current for incandescent lamps. The dynamo is driven by a water motor, the pressure on the mains being 115 lbs. to the square inch.

Three thousand dollars have been subscribed for the Fourth of July celebration, to include horribles, fireworks, balloon ascension, parade, horse races, and illumination of the park by the arc lights.

The new railroad, to be called the Rochester, Hornellsville and Lackawanna, to connect with the Delaware and Lackawanna Railroad, is assured.

The Gamewell fire alarm will be in operation by July 1st. MAPLE CITY'S

Hornellsville, N. Y.

The Influence of Electric Light upon the Eyesight.

In a recent issue of the *Berliner Klinische Wochenschrift*, Prof. Herm. Cohn, well known through his examinations of the eye of school children, makes some interesting and valuable remarks on the subject of lighting by electricity. According to him, the following are some general requirements to which all methods of artificial illumination should conform:

1. The light should not be dazzling.
2. It should not be too insufficient in amount.
3. It should not heat the eyes.
4. It ought not to flicker.

Electric arc lights, even when surrounded by an opaque glass globe, which reduces the amount of light by 30 or more per cent., are hurtful to the eyes, if the latter are a long time exposed to it, and cause them to weep, or even induce a slight redness of the eyelids. In order to obviate this evil, lamps should be placed so high that the eye is not forced to look steadily into the light. Incandescent electric lamps may be improved in the manner adopted with the glass bulbs for the incandescent light at the Munich Royal Theater, the bulbs being rendered opaque by grinding the glass. There is no difficulty, when lighting by electricity, in procuring a sufficient amount of light As regards the influence of the temperature of the flame upon the eye, it is stated that excessive heat causes a too quick evaporation of the moisture of the eyelid, followed by a disagreeable feeling of dryness in the eye. The latter and the head become heated, and a more or less severe headache is the result. Experiments by Prof. Cohn, Prof. Pettenkofer and Dr. Renk have clearly established the fact that electric light is infinitely superior to gas light in this respect.

Regarding, finally, the flickering of lights, Prof. Cohn states that it has not been definitely ascertained what changes are caused in the retina if the latter is exposed to a quick fluttering. As far as the lighting of streets, railroad depots and crossings, or parks, is concerned, the flickering is of no great importance. But from the oculist's standpoint Prof. Cohn considers it absolutely necessary that all flickering be removed in rooms or halls, where reading, writing or drawing is done. It seems doubtful whether or no it will be possible to comply with this demand in the case of arc lights, for here the flickering is caused by the unevenness of the carbon points, and it will be next to impossible to produce a perfectly homogeneous mass of carbon. It is different with the incandescent electric light.

Electric Light Installations in France.

Some very interesting statistics up to date of May 1st have been compiled and published in the *Bulletin International De L'Electricite* for May 31st. A summary is given in the following table:

	Number of installations.	Number of arc lamps.	Number of incandescent lamps.
Public roads	10	108	140
Public buildings	5	....	1,487
Theaters	14	324	8,244
Ships	25	52	5,947
Special houses	28	98	1,594
Shops, cafes	49	762	3,932
Museums	3	2	800
Workshops, factories	895	4,163	33,537
Timber yards for public works	8	61	10
Central stations	7	....	4,630
Photo-electric apparatus	....	300	...
	1,044	5,880	55,321

The above figures, although not absolutely complete, some few houses having failed to give the information demanded, are sufficiently accurate to enable one to form a very fair estimate of the state of electric lighting in France. In addition there are 42 installations for the electrical transmission of power, 310 horse-power being employed, the Gramme machines used therefor numbering 190.

Incandescent Lamp for Mining Purposes.

An interesting application of the electric incandescent light to mining operations recently took place at Lord Vernon's Poynton and Worth Colliery, near Stockport, England. The lower pump rod of the main pumping shaft of the Lady Pit, by which the pits are drained, broke, leaving the bucket in the bottom, some 600 feet below, and submerged in water. To remedy the rupture, divers were employed, and their operations were carried on by the light of a Siebe diver's electric lantern, worked by Thame's primary battery. The Siebe lantern is a strong appliance and weighs some 83 lbs. out of water. It consists of an iron cover permitting the conductors to pass inside to a cluster of four incandescent lamps, the light of which is reflected downwards by a white reflector in the roof. A stout glass globe encircles these, and is protected from injury by iron prongs around it. Fifteen cells of Thame's primary battery were employed, and the total light obtained was about 80 candles, a luminous sphere of some 6 feet in radius being obtained under water. Mr. Thame has designed a small hand lamp supplied by four cells of his battery within the lantern, which is now used in the ether chambers of brewers. It is of the utmost importance that this lamp should be safe and free from any liability to cause explosion of the ether. It is carried into the chamber by the operatives; and we are informed that Colonel Majendie has expressed his approval of the lamp for use in gunpowder works and magazines.

* * Three years ago, after a tornado had devastated the farm of a Georgia farmer, he found a two-year-old boy among the shrubbery of his garden. No one claiming the waif, the farmer kept him and cared for him. Last summer the farmer took the boy with him into Mississippi, and then another tornado took the child, and he has never been heard of since.

The Song of the Carbons.

BY CHARLES CARROLL.

[The universal law of molecular vibration is finely illustrated in the carbon pencils of the electric arc light used in some of the largest lighthouses. The molecular stir set up in the armature of the dynamo machines by rapid magnetization and demagnetization is transmitted to the carbon points of the lantern, and reappears as a distinct musical tone.]

A weird sweet melody, faint and far—
A humming murmur—a rhythmic ring—
Floats down from the tower where the lenses are;
Can you hear the song which the carbons sing?

"Millions of æons have rolled away,
In the grand chorale which the stars rehearse,
Since the note, so sweet in our song to-day,
Was struck in the chord of the universe.

"The vast vibration went floating on
Through the diapason of Space and Time,
Till the impulse swelled to a deeper tone,
And mellowed and thrilled with a finer rhyme.

"Backward and forward the atoms go
In the surging tide of that soundless sea
Whose billows from Nowhere to Nowhere flow,
As they break on the sands of Eternity.

"Yet through all the coasts of the endless All,
In the ages to come as in ages gone,
We know but the throb of that mystic thrall
Which binds, responsive, the whole in one.

"We feel but the pulse of that viewless Hand
Which ever has been and still shall be,
In the stellar orb and the grain of sand,
Through nature's boundless fraternity.

"The smile which plays in the maiden's glance,
Or the quivering beat of an insect's wing,
Is of kin with the North-light's spectral dance
And the dazzling zone of the planet's ring.

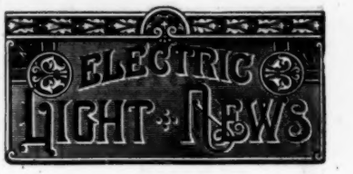
"From our lonely tower, aloft in air,
With the breezes round us, tranquil and free,
When the storm-rack pales in the lightning's glare,
Or the starlight sleeps on the sleeping sea,

"We send our greeting, through breathless space,
To our distant cousins, the nebulæ,
And hail, in the comet's misty trace,
But a drifting leaf from the tribal tree.

"The song we sing is but one faint sound
In the hymn which echoes from pole to pole,
Which fills the dome of Creation's round,
And catches its key from the Over Soul.

"And when it ceases, all life shall fail;
Time's metronome shall arrested stand;
All voice be voiceless—the stars turn pale—
And the Great Conductor shall drop his wand!"

PARIS, September 1st, 1881.



—— Warren, Ohio, is agitating the question of electric illumination.

—— Mr. D. D. Dickey, of the Pittsburgh Carbon Company, reports quite an activity in the carbon trade. He has been in this city for several days enjoying his wedding trip, having been recently married to Miss H. R. Hamilton, of Pittsburgh.

—— The American Electric Illuminating Company are erecting an electric light station at Hornellsville, N. Y. They will use two Armington & Sims Co's engines and set their boilers with the Jarvis patent furnace. This plant started June 1.

—— The Winsted, Conn., Gaslight Company has decided to put up some electric lights, and twenty-four will soon be in operation. They will displace seventy-five of the old street gas lights, and give a much better illumination. It is expected that a number of private concerns will also take the electric light.

—— The Automatic Electric Light Company has been organized at Portland, Me., with the following officers: President, Charles H. Magoon; treasurer, George D. Burton; directors—Charles H. Magoon, Luther E. Lewis, George D. Burton, Josiah T. Wilson, Murray D. Livingston. Capital stock, $100,000.

—— The Armington & Sims Engine Company are working 120 men in their engine factory, and in several recent cases have been unable to furnish engines ordered by electric lighting companies. This is one of the most active industrial fields to-day, and those dealers who are properly presenting their work to it are receiving most satisfactory returns.

—— After nine trials before Mr. Justice Butt, in equity, the patent action brought by Mr. Edison, of New York, against Woodhouse & Rawson, of London, for the maintenance of his claims on the exclusive use of filament of carbon in electric lighting, terminated with a decision in favor of Mr. Edison, the Court having decided to maintain his claims in their broadest sense.

—— The Middlesex Electric Light Company, which operates Lowell district, held its annual meeting last Tuesday, June 8th. The following officers were elected: President—George W. Fifield; Secretary and Treasurer—John H. McAlvin; Directors—C. R. Kimball, W. P. Burbank, J. H. McAlvin, G. L. Hunter, W. A. Ingham, L. N. Downs; Manager—J. Y. Bradbury. The company operates 270 lights, and the receipts for lights for the year were $34,030.

—— The Chemical Electric Light and Power Company, of Boston, have received an order for their Volta Pavia battery to be put to a new and unique use. The proprietor of an extensive sheep ranch in Montana intends using the battery for maintaining a platinum wire at a white heat, which will be used for branding the members of his flock on the nose. The operation is quickly performed, and comparatively painless, when the former plan of using the clumsy branding iron is considered. An eight-cell battery will probably be required.

—— Messrs. Sir Hussey Vivian & Sons, of Swansea, England, about a month ago purchased from Messrs. Mather & Platt one of the largest dynamos hitherto constructed for electrolytic purposes. It has an output of 50 volts, 1,000 amperes, at 400 revolutions. The weight of the entire machine is 5½ tons; the magnet limbs are solid forgings, each weighing 22 cwt., and are shunt-wound only, each limb having 260 lbs. of copper wire. The armature is constructed of bars 0 838 square inch area, and has a resistance as low as 4.0016 ohm. The commercial efficiency of the machine is said to be over 93 per cent.

—— Messrs. J. H. Bunnell & Co., of this city, are manufacturing dynamos, having added this important branch to their well-established electrical business.

—— The Ben Franklin Electric Light Company, of Manchester, N. H., has been organized. The capital stock is $10,000. Permission has been granted by the City Council to string wires and set poles in the city. L. B. Clough, G. W. Riddle, N. P. Hunt, Hiram Hill and L. P. Gerould are among the interested citizens.

—— At the annual meeting of the electric light company, of Mobile, the following directory was re-elected: O. F. Cawthon, Samuel Brown, Mark Lyons, John E. Michael, and J. K. Glennon. Mr. O. F. Cawthon was re-elected president, and Mr. R. C. Cawthon secretary. The directory resolved to increase the machinery plant 50 per cent., which increase will permit of the placing of some forty additional lights.

—— The electrical business in Baltimore is booming. The Southern Electric Company of that city has just disposed of a sixteen-light Brush plant, and has in addition just completed a large contract for motors for the Edgerton Motor Company, of Philadelphia. There were 500 motors included in the contract Messrs. Morrison and Tuxworth, the proprietors of the Southern Electric Company, have a strong staff of expert workmen, and this with their splendid facilities comprise an electrical manufactory of the first order.

—— A singular accident is reported to have happened to a man named Reed in Little Rock, Ark He observed that a street electric light wire had been disconnected, and very carelessly walked up to receive a slight shock. He grasped hold of the wire with both hands, and was instantly knocked insensible and had every particle of flesh torn from both hands and arms from his fingers' tips to the elbow. He was carried into a neighboring house, where he continued unconscious. It is the most singular accident on record, and the doctors say the man cannot recover. The flesh was stripped as cleanly from the bones as it could have been done by the most careful physician.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 8, 1886.

343,082 Multiple electric cable; John Joseph Charles Smith and Michael Smith, Passaic, N. J.; said John Joseph Charles Smith assignor to John H. Cheever, New York, N. Y.

343,083 Manufacture of electric cables; John Joseph Charles Smith, Passaic, N. J., assignor to John H. Cheever, New York, N. Y

343,084 Vulcanizing the insulating covering of electric conductors; Michael Smith, Passaic, N. J.

343,087. House wiring for electric lights; Luther Stieringer and Jonathan H. Vail, New York, N. Y.

343,095 Railway telegraph; Charles W. Williams, Cave City, Ky.

343,099 Process of manufacturing electric conductors; Edward G. Acheson, New York, N. Y.

343,101 Electric railway; Edward M. Bentley, Brooklyn, N. Y.

343,129 Dynamo-electric machine; Arthur G. Ketchum, Winchendon, Mass.

343,169 Automatic billiard register; Joseph J. Gleason, New York, N. Y.

343,176 Electric motor; Enos T. Higham and Daniel Higham, Philadelphia, Pa.

343,188 Arc lamp; Otto A. Moses, New York, N. Y.

343,227 Electro-magnet; Elisha B. Cutten, Pittsburgh, Pa., assignor to the Electrical and Mechanical Developing Co., same place.

343,242 Electric arc lamp; Oscar F. Jonsson. Stockholm, Sweden.

343,266 Electric switch; Alexander Bernstein, London, England.

343,313 Holder for incandescent electric lamps; L. Heinze, Lynn, Mass.

343,334 Telephone; James F. McLaughlin, Philadelphia, Pa.

343,372 Circuit-closer; Harvey H. Hoffman, New York, assignor by direct and mesne assignments to Brown & Brown, Rochester, N. Y.

343,373 Reverse current interceptor for electric circuits; Alfred G. Holcombe, New York, N. Y., assignor to the Equitable Electric Company, same place.

343,374 Electrical communicating system; Alfred G. Holcombe, New York, N. Y., assignor to the Equitable Electric Co., same place.

343,392 System for controlling secondary-battery circuits; John M. Pendleton, New York, N. Y., assignor to the Equitable Electric Company, same place.

343,393 System for regulating and controlling electric motors; John M. Pendleton, New York, N. Y.

343,394 System for regulating and controlling electric motors; John M. Pendleton, New York, N. Y.

343,444 Electric motor; John Doyle, Hoboken, N. J., assignor to himself and C. Coles Dusenbury, New York, N. Y.

343,449 Telephone; Ezra T. Gilliland, Boston, Mass., assignor to the American Bell Telephone Co., same place.

343,450 Electric meter; J. Rossgrove, York, Pa.

343,458 Underground conduit for electrical conductors; Geo. S. Hull, Elmira, N. Y.

343,468 Telegraph sounder; James A. Maloney, Washington, D. C.

343,469 Convertible telegraph key; James A. Maloney, Washington, D. C.

343,487 Electric motor; Henry M. Paine, Newark, N. J.

343,515 Electrical coupler; George D. Burton, New Ipswich, N. H.

343,539 Cash Carrier; Thomas M. Kenney, Cambridge, Mass., assignor to the Kenney Electrical Cash Carrier Co.

BUSINESS NOTICE.

To Members of the National Electric Light Association.

A meeting of the Executive Committee of this Association will be held at the Hotel Dam, New York, June 29. All persons who expect to prepare papers for the Detroit meeting, or who may have any facts of interest to the Association that they desire to present, are requested to notify the committee at this meeting; addressing as above.

A. J. DECAMP,
Chairman Executive Committee.

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SPECIAL NOTICE.

National Electric Light Association,

SEMI-ANNUAL MEETING.

THE FOURTH MEETING—semi-annual—of the NATIONAL ELECTRIC LIGHT ASSOCIATION will be held at DETROIT, MICH., on Tuesday, 31st day of August, at 10 o'clock, A.M. Dues being payable in advance, all members are required to forward the same for the year 1886, by check or otherwise, payable to the order of J. F. MORRISON, President, Baltimore, Md.

Electric Light Companies and Manufacturers of Electric Light Apparatus, Supplies, &c., desiring to become members, must apply on or before August 31st, to the President, J. F. MORRISON, Baltimore, Md.

Members and others desiring information as to R.R. transportation rates will address J. F. NOONAN, Esq., Chairman Com. on Transportation, Paterson, N. J.

Special Hotel rates will be made known previous to meeting of the Association.

A. J. DeCAMP, Chairman Ex. Com.
Philadelphia, Pa.

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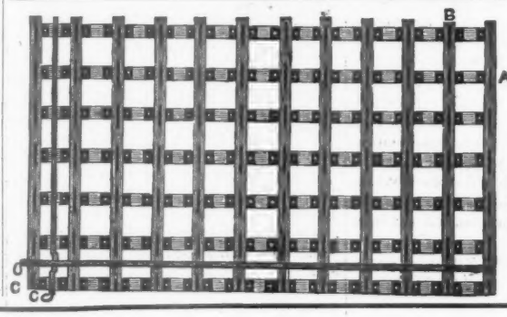

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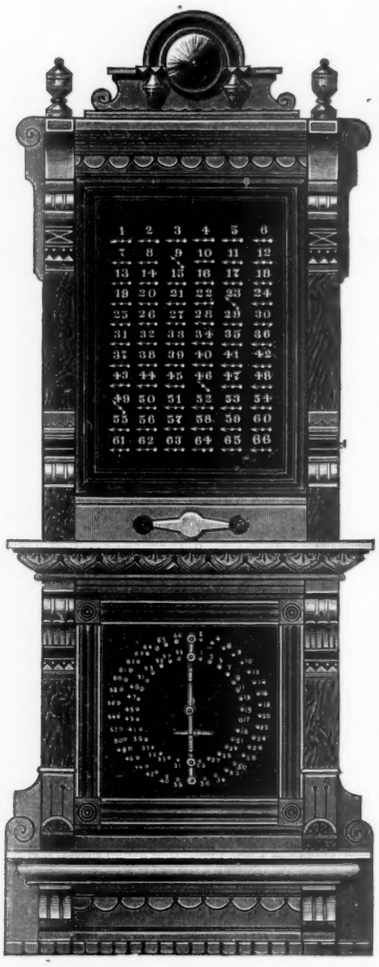

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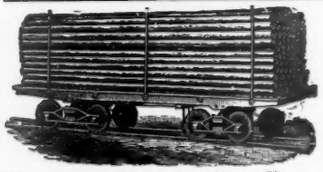

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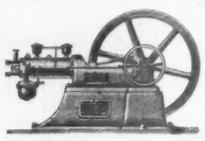

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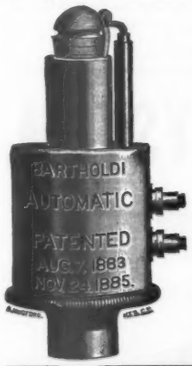

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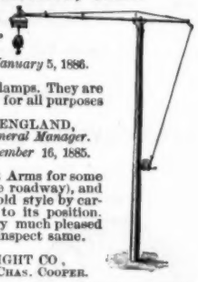

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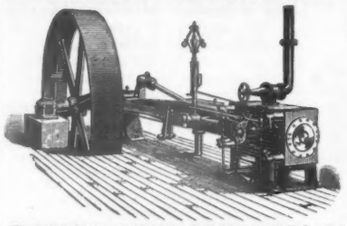

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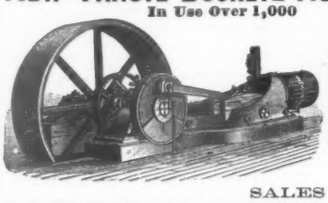

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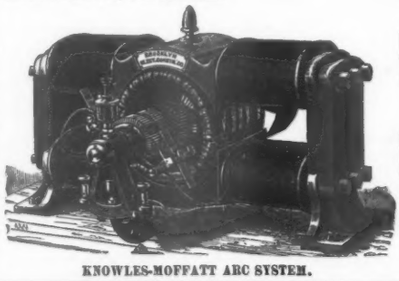

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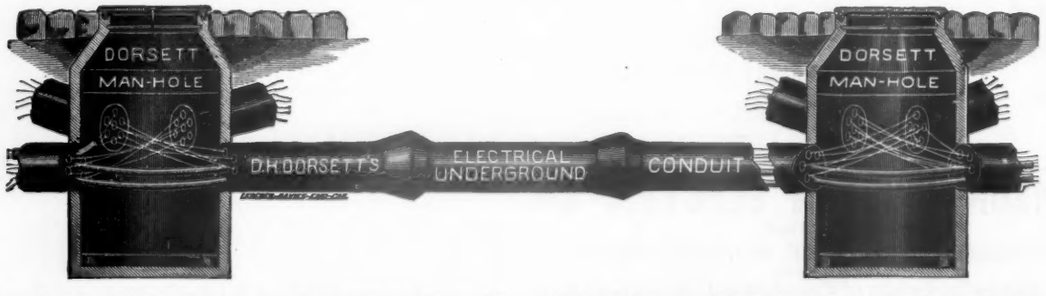

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The 3¼-inch ducts in this Conduit are leased to different companies, which may then occupy them with such wires and cables as they may adopt. New wires may be introduced or old ones replaced through these ducts between the man-holes as shown in the cut.

An experience of six years for Underground Drainage has shown the superiority of this material as a resistant of moisture, and its consequent immunity from damage by frost. It has been in use for electrical purposes the past winter in the solidly frozen streets of Chicago without injury; is the system used by that city, giving perfect, unbounded satisfaction, and is now being introduced into the cities of St. Louis, Cincinnati and Detroit. The whole body of the Conduit is a thoroughly reliable insulator, unaffected alike by acids and alkalies. The cheapest and most perfect Conduit in the market to-day.

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THE CONSOLIDATED ELECTRIC LIGHT CO. SAWYER-MAN SYSTEM TRADE MARK

No. 3.

SAWYER–MAN
vs.
EDISON.

EXECUTIVE OFFICES, MUTUAL LIFE BUILDING,
NEW YORK, June 9th, 1886.

Among the suits which The Consolidated Electric Light Company, the owner of the Sawyer-Man patents, has against the Edison Electric Light Company for infringement, is one upon patent No. 211,262, issued January 7th, 1879, for the method of preparing the illuminating part of an incandescent lamp.

First.—Treating the carbon electrically in a hydro-carbon vapor or liquid.

Second.—Electrically expelling the occluded gases from the carbon and electrodes in the chamber of the lamp.

THE EDISON COMPANY PROTESTS UNDER OATH:

First.—"We do not use the methods described in the patent."

Second.—"The methods described are old and impracticable, and the patent is therefore void."

These protestations will hereafter be classed among the electrical humors of the day,—

First.—Because, witnesses from the Edison factory, summoned by the plaintiffs, swear that they treat the carbons electrically in a hydro-carbon liquid.

Second.—Because in the famous contest in the Patent Office, from 1880 to 1885, between Edison and Sawyer & Man, after elaborate argument upon voluminous testimony, the Commissioner of Patents,

IN DECIDING THE CASE,

addressed himself to the following question:

"Are the inventions claimed by the respective parties substantially the same?"

And answered it thus—

"Carbons when prepared by either of the parties in the manner described by them become incandescent conductors when placed in a lamp from which the oxygen has been removed, either by exhaustion, by a pump or by expulsion by hydrogen or nitrogen gas. Neither will operate unless the oxygen is removed, and both will when it is."

"In other words, each carbon becomes an incandescent conductor under substantially the same conditions; they are, therefore, substantially the same and must be so held." * * *

"This invention was completed in a legal sense when either of the parties to this controversy had devised means by which to demonstrate its practicability." * * *

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Third.—Because about two years ago the parties who owned this Sawyer-Man patent for England (commonly called the "Cheesebrough patent") were induced to sell it, and it has recently transpired that Edison and Swan were the real purchasers.

Their English Company immediately brought suit upon this Sawyer-Man patent against Woodhouse & Rawson, their principal competitors in England, and on Tuesday, the 25th of May, 1886, after five days' trial, his Lordship, Mr. Justice Butt, decided that the patent was valid, and that the defendants were infringing it; and awarded an injunction against them in favor of the Edison Company.

According to Mr. Edison

This Patent is Bad in America, where he is the infringer, **But Good in England,** where he is the owner.

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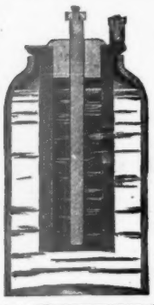

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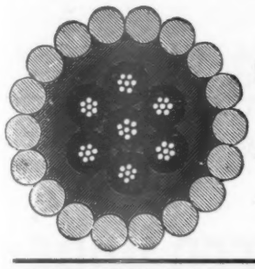

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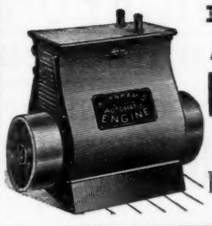

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